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Engineers Meet to Consider Water Power

Power Plant Operators and Paper Mill Engineers Discuss Power Needs and Water Flow To Avert Possible Shortages — Badger Tissue Mill Increases Wages 5 Per Cent — Other Industrial News.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., July 14, 1941—Water flow control which will avert power shortages was under consideration by paper mill engineers and power plant operators of the Wisconsin River Valley at a meeting Thursday afternoon, July 10, at the offices of the Wisconsin Valley Improvement Company at Wausau, Wis.

It was pointed out that the upper reservoirs are at about 68% of capacity at the present time and the storage is 7,029,000,000 available cubic feet, as compared to more than 9,000,000,000 in the corresponding week in July for the last three years. The largest storage, the reservoir in the Big Eau Pleine River, is filled to capacity.

While the reservoir situation is not abnormal for July, the engineers stated the lack of rainfall gives little promise that the supply will be favorable for the remainder of the summer. The fourteen stations maintained by the Improvement company reported an average of .35 of an inch of rainfall for the last week.

According to M. W. Kyler, manager of the company, the deficiency in precipitation began as early as last November and is almost certain to change during the late summer or fall on the basis of past records. The scarcity of snow last winter has had its effect on ground water throughout the area.

Power needs of the various mills and generating plants were given consideration by the engineers, who will make up a schedule showing how much water is to be released from the reservoirs for maintenance of the river flow.

Badger Tissue Increases Wages

Employees of the Badger Tissue Mill, Kaukauna, Wis., have been given a 5% increase in wages and a week's vacation with pay, according to Lewis F. Nelson, president. All hourly paid workers will benefit.

Thilmany Safety Contest Close

Thilmany Pulp and Paper Company completed a six months' safety contest June 30 between the "Red" and "Blue" teams, in which the Reds were the winners with a 38-point lead, according to L. C. Smith, personnel director. Each team had 10,000 points at the beginning of the contest with points being added or deducted according to a set schedule. The Reds had 10,063 points and the Blues 10,025. Credits of ten points were given for each worker who purchased safety shoes, and 100 points were allowed for each month without a lost-time accident. Each day lost through injury brought a penalty, with additional losses for cases requiring the attendance of a doctor.

The annual Thilmany mill-wide family picnic is to be held at La Follette Park Sunday, July 27, with Norbert Gerend as general chairman. Numerous committees have been appointed to arrange recreation events and provide stands and refreshments. The mill is to be shut down for the day.

Kimberly-Clark Golfers To Meet

Golfers of the Kimberly-Clark Corporation will hold their annual jamboree at Ridgeway Golf Club, Neenah, Wis., Saturday, July 19. It will also be the qualifying round for the annual tournament, to be held later.

Pairings for the four championship flights will be posted after the qualifying rounds, and the F. J. Sensenbrenner, Ernst Mahler, S. F. Shattuck and Harry Price trophies will be awarded to winners of the four flights. First round matches in the tournament must be played by August 3, and each successive round must be completed by the following Sunday. A dinner will be held at the close of the jamboree.

Nuptials in the Paper Industry

Robert Sage, son of Mr. and Mrs. Charles H. Sage, of Neenah, Wis., and Miss Mary Fannon, daughter of Mr. and Mrs. George C. Fannon, Appleton, Wis., were married at the bride's home Thursday evening, July 10. The ceremony was performed by Dr. Robert K. Bell, pastor of Memorial Presbyterian church. The couple will return from a honeymoon trip to Upper Michigan and Mackinac Island in time to attend the wedding Saturday, July 19, of Miss Peggy Jennings of Appleton, daughter of Mr. and Mrs.

(Continued on page 50)

Canada Comments on Price of Newsprint

Investors In Newsprint Securities Talk of Possibility of Advance In Current Quotations But Increase Is Not Considered Certain Now — Aspects of Domestic and Canadian Situation Discussed.

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., July 14, 1941—There is some talk among investors in newsprint securities to the effect that a general advance in price is due, but there is little evidence that their hopes will be fulfilled. The idea seems to have been given a fresh stimulus by the reference in the third-quarter price announcement of the International Paper Company, in which the president, R. J. Cullen, stated that "the factor of increasing costs of manufacture and transportation is steadily becoming more of a problem."

Should the $50 level, f.o.b., New York, remain in effect for the final quarter of 1941, customers of the Canadian newsprint industry will have enjoyed four full years of price stability, an achievement that has been advocated for many years by both the Newsprint Association of Canada and many individuals.

Why Current Prices Should Prevail

A very real reason why there should not be an advance in the price at this time is the fact that United States mills, for three and one-half years, generally, have delivered newsprint at a price below the Canadian price applicable to most mills. In 1938, the price advanced $7.50 a ton to $50. Most U. S. mills held to $48. This was raised to $49 in 1939, and held there ever since, but still $1 a ton below the Canadian price. Since at least one mill in the U. S. has announced maintenance of this price for the entire second half of 1941, indications appear to be that this example will be followed by other U. S. mills. At the most, the one dollar increase might be a possibility, concede some financial authorities, but no more.

Another factor, pointed out by "Financial Counsel," is that Canadian mills have been enjoying, ever since the outbreak of war, a 10% premium existing on a large percentage of exports paid for in U. S. funds. These include, not only shipments to the United States, but to all territories outside the sterling area. This represents, net, about $4.50 extra per ton for such markets. Something over $10,000,000 was the premium on 1940 shipments to the United States alone. Any increase in the Canadian price of newsprint at present, in the face of this advantage, might be expected to arouse antagonism among U. S. customers. This might not be injurious just at the moment, but would be certain to stimulate purchases from Scandinavian mills when normal conditions of international trade return, and in 1939 well over 300,000 tons of newsprint reached the United States from that source, against not a single ton in April, 1941.

Transportation Problem More Acute

The reference by the International Paper Company president "that transportation is steadily becoming more of a problem," seems to be well substantiated by the facts.

Water-borne newsprint traffic to the United States has been reduced to almost negligible proportions and dependence on rail movement is greater than it has been at any time in the past 15 years. Most newsprint manufacturers are of the opinion that a shortage of freight cars may develop between next September and November.

This does not imply a shortage of newsprint for American publishers, as the same interests are confident that if the publishers continue their present policy of taking deliveries in equal monthly installments, there will be no actual shortage. The car shortage, they expect, will be only temporary, during the peak of the crops movement.

The matter of transportation has been occupying the attention of both the newsprint manufacturers and the publishers for some time. They have been watching the situation carefully, ready to take precautionary measures, if and when necessary.

Ordinarily there is a fairly heavy movement of newsprint from Canada to the United States via the Atlantic coastal trade. This applies to shipments from the mills in northern Quebec, New Brunswick and Nova Scotia. The commandeering of ships in the coastwise traffic has been going on steadily, with the result shipping space is now scarce. It is not expected the situation will undergo any material improvement in the next few months. Already a considerable tonnage has been diverted from the coastal trade to rails.

Much the same situation applies to those companies in central Canada which have been accustomed to ship by water to their customers in the States. Many of the lake boats have been transferred to the Atlantic coastal trade to replace those put into trans-Atlantic service.

All this has meant greatly increased newsprint traffic for the railway companies. So far the manufacturers have not experienced any real shortage of cars. At times there has been a tightness of car supply, but the situation has never developed into anything like a serious shortage.

Reduction in Newsprint Output Discussed

Another favorable feature for the Canadian newsprint manufacturer that is again being talked about, is the possibility of some of the U. S. newsprint machines being converted to make other and more profitable grades of paper. There was some talk of this a year ago, but the expectations in that regard were not realized. Of late, however, according to some in the trade, there have been some faint signs of this movement taking place before the end of the year.

In the event some of the American machines are taken off newsprint, there should be a better demand for Canadian newsprint from American sources. This is not expected by Canadian manufacturers to be a net gain, as already there has been a tapering off in overseas demand. Any additional business which may originate in the States from the changing over of machines is not expected to do much more than offset the losses in overseas trade. If it does this, it is all to the good, because it will enable Canadian mills to maintain their operating schedules.

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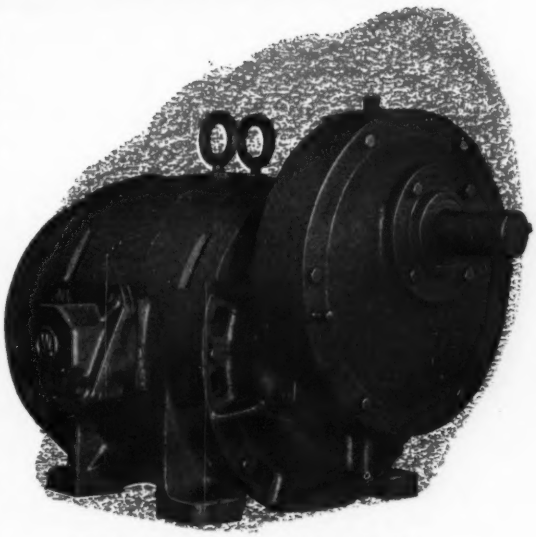

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Buying of Paper Items Heavy in Chicago

Steady Increase In Orders Flowing Into Midwest Territory As Demand For All Grades of Paper Continues Heavy — Plans For Sept. National Paper Trade Meeting Taking Shape—Other News.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., July 14, 1941—The local paper market continued to move ahead as mid-summer season saw only an increase of orders pouring in on virtually all types of paper sellers. The market, however, was steady and prices ranged firm at their registered a few weeks ago. Slack had disappeared all along the line and Chicago interests seem confident that there will be no let-up as general business swings into high as far as defense industries are concerned. We learned of no lines not from 90 to 100 days behind as far as mill production is concerned and it is reported that some mills are from 11 to 14 weeks behind schedule. The industry is not losing sight of the heavy costs of production and increased taxes in the offing which has something to do with the commendable rationality of procedure here.

Krafts continue very active with demand very heavy and prices firm. Sulphites found all grades enjoying the general strengthening. Bonds and ledgers of all types were strong while books and covers found plenty of buyers to give a very strong tone to the market. Groundwoods are finding it hard to fill orders as mills worked steadily in an effort to "catch up," according to local reports. Newsprint was also firm. The board market matched the general betterment the country over while waste papers held strong in all grades, particularly the top variety.

C. W. Musick Retires

C. W. Musick, executive of the Graham Paper Company for many years, recently retired from active participation in the interests of that well known company with the retirement to take effect on July 1. Efforts to give Mr. Musick a real "bon voyage" into the realm of retirement got a rude jolt when the popular executive preferred to save his friends some money and himself some embarrassment in listening to what was certain to have been a long string of testimonials.

Display Christmas Lines at Meeting

If the "early bird gets the worm," the Bulkley, Dunton & Co. sales force seems headed for a successful Christmas season. The company exhibited an impressive line of papers for late Fall and Christmas trade at the annual convention of the International Association of Display Men held last week at the Sherman Hotel. N. R. Aberbanel, S. B. Holtz and Harvey Ferrill represented the company from the Chicago office.

Show Concern Over Export Trade

The Export Managers Club of Chicago, which includes several paper executives, has recently sent a letter to the Secretary of State and other government officials indicating serious concern over a shortage of shipping vessels engaged in foreign trade as a result of government requisitioning. The communication was signed by Gaylord Whipple, president of the Club, and urged careful consideration of foreign trade requirements in framing the government's future shipping policy. The Club pointed out that difficulty in securing cargo space to all major markets outside the war zone was seriously affecting American business. The Club expressed a desire not to be considered "critical" but to point out the facts concerning the "grave position in which exporters find themselves."

Freight Association Holds Meeting

In a meeting of genuine importance to paper firms depending upon trucks for a large share of their transportation work, the Central Motor Freight Association held its first annual meeting in Chicago this week. Meeting at the Stevens Hotel, the group of trucking executives discussed the Motor Carrier Act and its effect on selling and cooperation in its enforcement with Frank Purse, district director of the Interstate Commerce Commission of Chicago, as the speaker. The group carefully reviewed state legislative trends and, all in all, covered ground expected to have an immediate and beneficial effect on that considerable portion of industry which depends upon the truck to move its freight.

Fraser Joins Paper and Twine Club

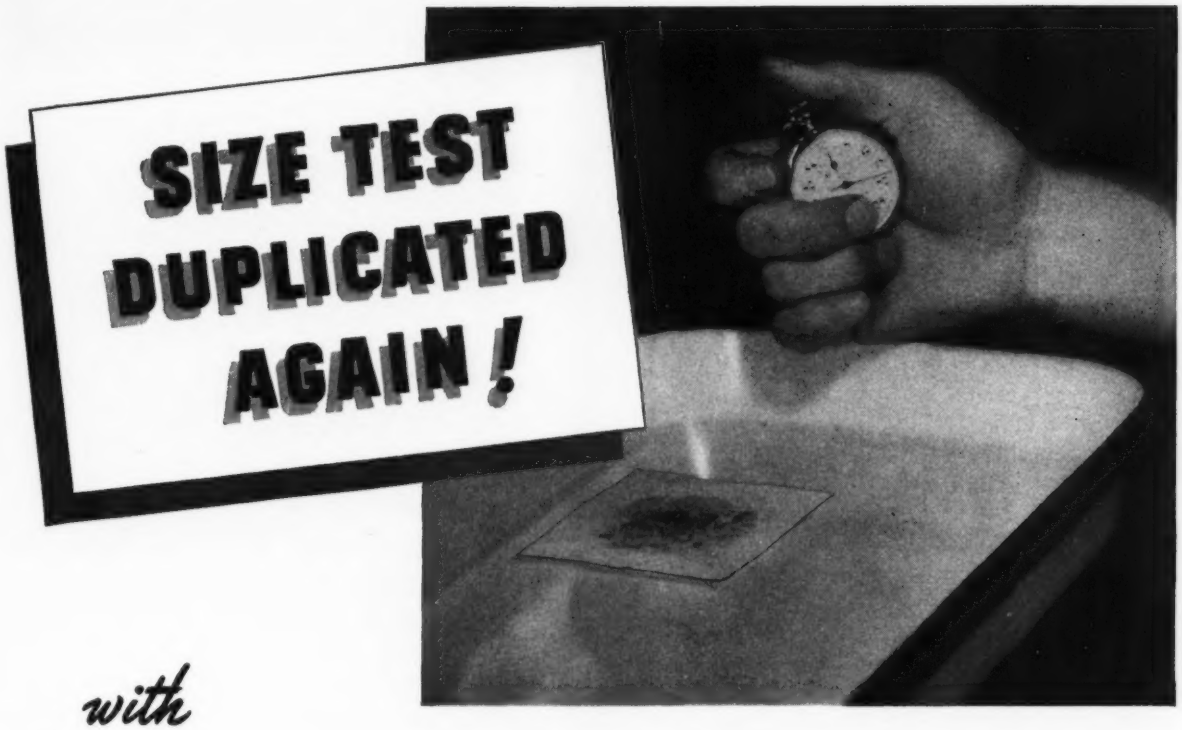
One new Chicago addition to the Paper & Twine Club is announced by John Richey, executive secretary. The new addition to the group which is doing so much to cement better understanding between production and distribution in the industry is H. J. Fraser of the Tanglefoot Company of this city.

Paper Houses Add New Lines

Strathmore Troubadour, a product of the Strathmore Paper Company Mills, has been stocked recently by both the James White Paper Company and the Chicago Paper Company. Another new Chicago line is Woodbine Colored Offset Enamel, made by the Appleton Coated Paper Company stocked by Berkshire Papers, Incorporated. Berkshire already has a new and attractive price sheet describing this paper which comes in six colors.

Plan for N.P.T.A. Meeting

At least two separate groups are already doing a long range bit of preparing for what even now promises to be one of the outstanding meetings of the year, the Fall convention of the National Paper Trade Association scheduled for Chicago on September 15 to 17, inclusive. One of the groups, in addition, of course, to the headquarters staff arranging the program, is the western division of the Salesmens Association of the Paper Industry which is making plans for its final golf outing at the Olympia Fields Country Club to synchronize with the entertainment side of the convention. The other is the Exhibits Committee of the N.P.T.A. which has already approved the usual exhibit of wrapping papers and paper products which has grown into a feature of these affairs. The Stevens Hotel will again be the site of these exhibits.



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Paper Men Plan to Hold "Industry" Meetings

Position of Paper Merchants In the National Emergency To Be Explained In Series of Open Meetings Scheduled To Be Held In East and Midwest—Representative From Office of OPM To Speak.

Due to current conditions The National Paper Trade Association has felt it wise to schedule a series of "industry" meetings throughout the Eastern and Midwest sections of the country. Subjects of increasing interest to the paper merchants will be discussed at these meetings and will cover the following topics:

Government orders for paper and paper products.

Government requirements for chemicals and other materials needed in paper manufacturing.

Growing transportation problems, price ceilings, allocation of mill production, and priorities.

The purpose of these meetings is to outline the paper merchants' position in the national emergency and to advise as fully as possible as to developments that may be expected. Invitations to those meetings are being sent to all paper merchants regardless of whether or not they are affiliated with the N.P.T.A.

Meetings Planned For July and August

The schedule includes meetings in Allentown, Pennsylvania, on July 16, Philadelphia, on July 17, and a general mass meeting in New York on the night of July 17, at which a representative from the Pulp and Paper unit of OPM will deliver an address. A meeting in Boston will be held on July 21 at which a representative from OPM will speak. Meetings will also be held in Syracuse on July 22, Rochester, July 23, Buffalo, July 24, and Albany on July 25. Tentative arrangements have been made for a meeting in Cleveland, on August 4, Pittsburgh, August 5, Detroit, August 6, Cincinnati, August 7 and Chicago, August 8.

Paper merchants throughout the entire United States are daily more forcibly demonstrating their desire to do their part in our national defense program and the dissemination of vital information to the merchants through these industry meetings is merely another step toward helping them to do their part.

Philadelphia Paper Men To Meet

The following notice, over the signature of George W. Weaver, president of the Philadelphia Paper Trade Association, was sent out to all members of the Association a day or so ago:

"Developments tending toward curtailment of your paper supplies occur in rapid succession. It is highly important that all members of the trade be constantly informed of these developments. Paper merchants' essential services to all classes of consumers must be justified and maintained.

"Therefore, it has been decided that an industry meeting will be held on July 17, at 1:30 P. M. in Room 631 of the Drexel Building. The purpose of this meeting is to outline the paper merchants' position in the national emergency and advise them as fully as possible as to developments that may be expected.

"The highlight of the meeting will be an address by C. W. Boyce, Assistant Chief Consultant, Pulp and Paper Unit, Office of Production Management. Mr. Boyce will interpret recent developments affecting the paper industry as these developments pertain to distribution, and will also devise as to probable future developments which will have their effect upon business.

"This is not an association meeting—it is an industry meeting."

June Newsprint Statistics

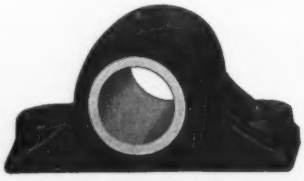
Production of newsprint in Canada during June 1941 amounted to 273,697 tons and shipments to 281,843 tons, according to the News Print Service Bureau. Production in the United States was 83,962 tons and shipments 85,424 tons, making a total United States and Canadian news print production of 357,659 tons and shipments of 367,267 tons. During June, 29,603 tons of news print were made in Newfoundland, so that the total North American production for the month amounted to 387,262 tons. Total production in June 1940 was 430,367 tons.

The Canadian mills produced 20,853 tons less in the first six months of 1941 than in the first six months of 1940, which was a decrease of one and three-tenths per cent. The output in the United States was 6,125 tons or one and two-tenths per cent more than in the first six months of 1940; in Newfoundland production was 4,211 tons or two and five-tenths per cent more, making a net decrease of 10,517 tons, or five-tenths of one per cent less than in the first six months of 1940.

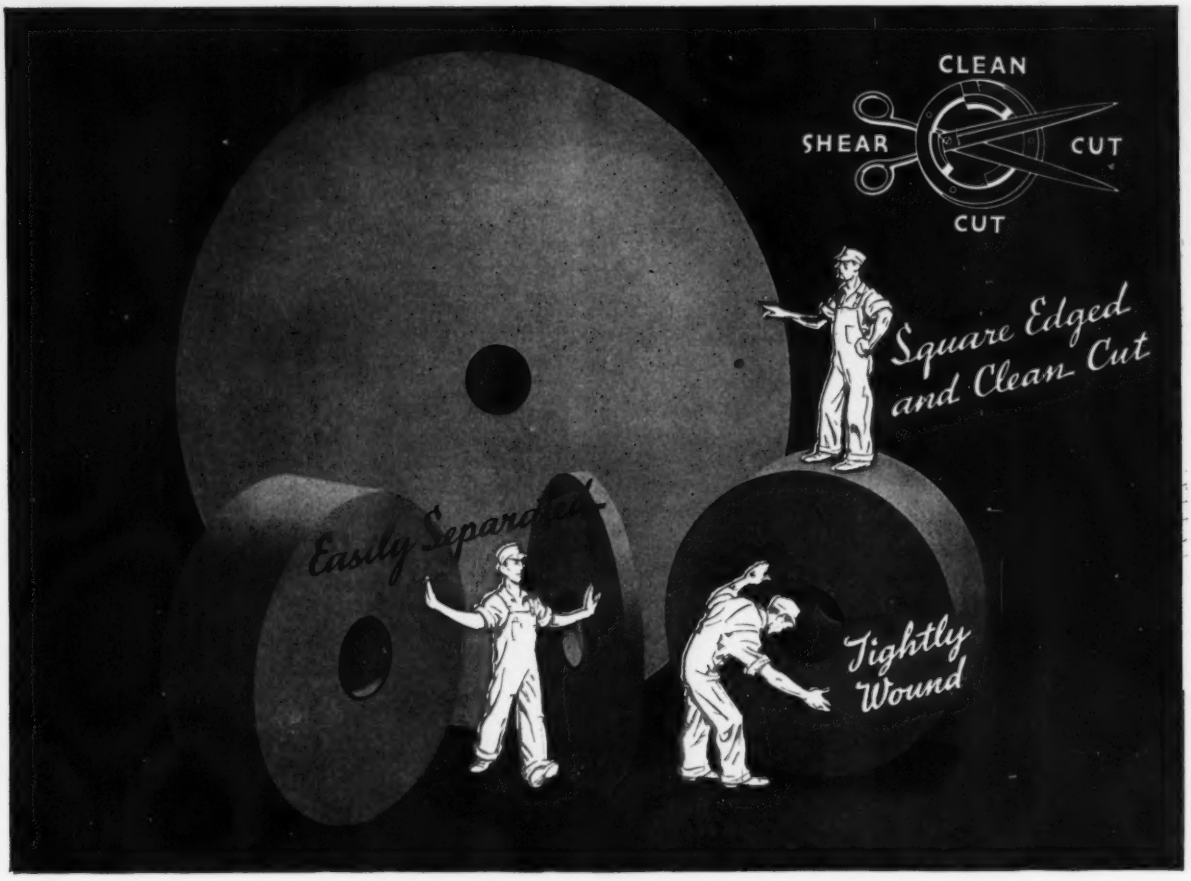
Stocks of news print paper at the end of June were 165,898 tons at Canadian mills and 12,065 tons at United States mills, making a combined total of 177,963 tons compared with 187,571 tons on May 31, 1941, and 198,112 tons at the end of June 1940.

New Line of Journal Bearings

A new and improved line of solid and split journal bearings, carried in stock and neatly cased and labeled for prompt delivery, is announced by The Jeffrey Manufacturing Company, Columbus, Ohio. Of accurate dimensions with modern rounded lines and smooth gun metal finish, these precision-made bearings have machined bases and faced ends. Height to center line of shaft is rigidly maintained. The babbitted bores are broached to smooth hard surface and require no "wearing in."



Both styles are tapped for grease cups or pressure fittings. An ample storage groove in the top provides proper distribution of lubricant. In addition, the split bearing has feeder grooves on each side. Individual containers are furnished for easy handling and protection in shipping.



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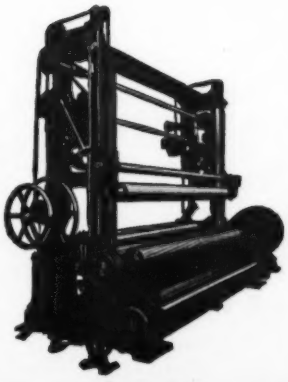

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LANGSTON

Types and Characteristics of Coating Starches*

By Glenn E. Price[1]

Abstract

Casein and starch are contrasted as binders for pigment coating especially from the standpoint of replaceability. The method of cooking starch products so as to secure the full binder action is explained. Various types of starch products are compared for their suitability as replacement for casein, and in this field chlorinated gums are distinctive.

General Properties of Starch

This paper reviews the commercial aspects of coating starches rather than the results of any fundamental research. You are well aware of the fact that, at present, starches are being used on many grades of papers made on brush and other standard types of coaters, where good ink receptivity, high press speeds, low offset and clear impressions are the major requirements. These properties are characteristic of properly made starch coatings.

Furthermore, for machine coated work, starch is almost exclusively used because it permits high coating speeds and low drying costs, which in general, are requisite in the low priced publication field.

The reliable suppliers of these coating starches are continually conducting research in an endeavor to find methods of improving their products. As a result, much technical data is available. However, because of the acuteness of the world situation it seems advisable to present actual down to earth facts at this time.

Timeliness of Topic

In a review of the market situation today, we find that other binders, predominately casein, used for coatings have undergone sharp increases of price, probably due to a scarcity of the raw materials which because of their food value are finding their way across the ocean both from this country and from South America. When we realize the full significance of this situation, we wonder if a question of supply may not be later involved.

For these reasons, great interest has been centered around the feasibility of using domestic starch products for as many phases of coating work as possible.

Many properties of casein are desirable but today the major question is "Are all these desirable properties essential?" A sound policy for all coating men right now, would be to decide for just which jobs casein is indispensable and to conserve the supplies for this work only.

Some of you may have had unpleasant experiences with starch, but please bear in mind that starch, in contrast to casein, is available in a wide range of types and a poor selection is most often responsible for many of the difficulties experienced. Present day coating starches when used with a knowledge of their natural limitations and adjustments made to balance their chemical and physical differences can be used in the great majority of cases as a replacement for casein.

Extent of Replaceability

In considering the natural limitations we find the major point of difference between starch and casein coatings is waterproofness. None of the starches commercially available today fulfill this purpose for coating. However, responsible firms in the starch industry are doing a great deal of research in this field. You will perhaps be interested to know that tremendous strides have been made in the production of water resistant starch products in the adhesive field, which find application in weather proof packaging for the defense industries.

While waterproofness is usually desirable, it is not always essential and in considering the type of coating binder where waterproofness is not essential starch products should offer a feasible replacement.

Another point of difference between starch and casein, and one which is superable, is bonding strength. A question most often raised by coating men not too familiar with modern coating starches is, "How can I get an adequate pick test with starch?" While this naturally is a complicated subject involving the various characteristics of the body stock, type of pigments, weight of coating, method of application, nature and type of starch binder used and other factors, it may suffice to say that when given the necessary information, the desired pick can be obtained by the proper choice of starch product in the great majority of cases, in general more starch than casein will be needed (thus the starch to casein ratio is about 1.3 to 1).

To give adequate pick it is desirable that the binder be uniformly distributed throughout the coating on the finished stock. Therefore adsorption of the binder on the pigment is helpful. This again brings about an inter-relation between types of pigments and the binder. Today reliable suppliers are aware of this and are able to produce high strength starches which exhibit extremely uniform distribution throughout the pigment. In addition to giving good bonding strength these products give the minimum amount of dusting.

A third point of difference between starch and casein is final gloss attainable. Starch is usually associated with dull coatings largely because it has long been used for cheaper grades of paper where light coats are applied or coarse pigments are used. The finish obtainable is more dependent on pigments used than on binder. However, with the same pigment composition starch coatings are slightly duller due to the higher percent of binder needed. This loss seldom exceeds 15 percent. By pigment adjustment and use of the proper starch, maximum gloss obtainable with a starch coating should not be far from that of casein coatings.

* Presented at the Annual Convention of the American Pulp and Paper Mill Superintendents Association, Poland Spring, Me., June 17-19, 1941.

[1] Sales Engineer, National Starch Products, Inc.

Another point which is sometimes questioned regarding starch coatings is the machining properties. Some coating men because of past experiences may feel that starch coatings are more difficult to handle on the coater. This usually means that they have not used the proper type of starch as there are starches available today which when prepared properly, machine as readily as the best casein coatings, with a wide margin of safety.

Manipulation of Starches

A. Physical Factors

A thorough understanding of how to get the maximum good out of any type of coating starch is probably best approached by recognizing that starch is an insoluble granule and must be cooked with water before developing any binder or adhesive action. The question of cooking necessitates time and temperature factors which vary with the basic types of starches, as well as with a variation of granular size for a given starch.

Thus, as a corn starch (even after processing) is heated in water to about 160 deg. F. it begins to enlarge much in the fashion of a balloon, and as such has no binder properties. As heating continues the granules continue to swell until as it approaches 195 deg. F. the swollen particles gradually burst to yield a gummy, adhesive mass. Naturally, to secure maximum binder action for a given quantity of starch it is necessary that all or nearly all of the swollen granules be exploded. Thus time must be allowed so that the slower swelling small granules (which are in fact retarded by the larger ones) will have an opportunity to burst. Figure 1 shows the properties obtainable with starch in each of the three stages. Any unexploded granules will merely act as a filler and will be of little use as a coating adhesive.

In order to assure that all granules are in the broken or colloidal condition, the cooking procedure should make provision for both time and temperature factors, and while some products cook more readily than others, 200 deg. F. for 10 minutes is a good average recommendation. It is of course necessary to assure that the temperature of the entire batch reaches the desired point by proper agitation.

Like many other materials the desirable properties of starches reach a maximum in the cooking procedure, and continued cooking or overcooking begins to break down these properties. Therefore caution must be exercised against overcooking as well as undercooking. Figure 2 shows a qualitative picture of what happens to the bonding strength as cooking proceeds. Note that maximum adhesion comes just after the granules break, and as heating is continued the colloidal particles are broken down with a resulting loss in strength.

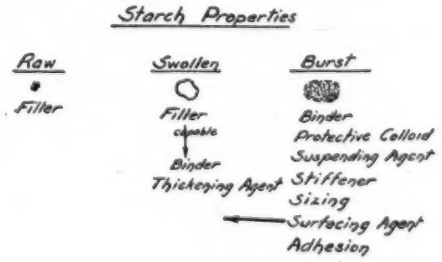


Fig 1

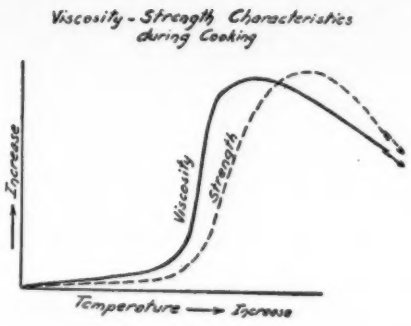


Fig. 2

B. Chemical Factors

When casein properly cut, is added to the clay slip good freeing action may be had. This is probably due to the absorption of the casein by the pigment and/or the absorption of the charges on the pigment. However, starch is probably absorbed to a smaller extent by the pigment and so little freeing action results. It is, therefore, desirable to make use of certain chemicals to offset this difference. Recourse is most frequently had to adjustment of the final pH to 8.5 or thereabouts. This adjustment is best made by adding alkali to the slip before adding the starch. Polyvalent cations such as phosphates e.g. sodium hexametaphosphate give more freeing action at the same pH than the monovalent alkalies such as NaOH, Na_2CO_3, and NH_4OH.

While borax, often used with casein, has good freeing action, it also has a decided effect on the viscosity and flow of the starch. Since it tends to increase the viscosity it must be used with discretion.

Results Achievable with Starch Products

The starch products available today for coating work must necessarily impart no color to coating mixes, thus coating starches are white products that cook to clear or transparent solutions in most cases. The majority of such products strive to fulfill to a more or less extent for the various types, the following characteristics which are tentatively accepted as the limiting requirements of suitable coating adhesives.

A) Good bonding strength and ability to eliminate dusting.
B) Minimum deviation from standard viscosities.
C) Little or no tendency to lower brightness and opacity of finished paper.
D) Little or no undesirable odor.
E) Resistance to chemical and bacterial deterioration.
F) Production of papers with desirable printing properties.
G) Price range so as to enable use in coated papers.

Starch products available for coating fall into three broad but basic classes.

They are:

1. Enzyme converted starches
2. Thin boiling starches
3. Chlorinated starches

However, each must be further subdivided because of the wide range produced within each class. The most common variation is probably the production of several standard fluidities within each class. The method of manufacturing gives various properties

to each variation. The type of raw starch, whether it be root or cereal starch, also varies the properties of the finished product.

To review briefly the general characteristics of each we find that enzyme conversion includes the treatment of both corn and tapioca starch. In the past tapioca starch has often been used with enzymes, but due to the scarcity of bottoms and probable restrictive action on the part of our Government, we should all take a realistic view of the supply situation on this starch today.

In all enzyme conversions there is need for close control to assure uniform coating viscosities. The importance of this uniformity is enhanced when the final product is to be used at a high concentration of solids as in the case of coatings.

In the thin boiling starches we find products of uniform viscosity, but relatively low in strength and stability properties.

The chlorinated starches possess the highest bonding strength, have the best flow characteristics with excellent stability and of course are available in various standard viscosities.

While there are uses for each type of coating starch available today the properties of chlorinated starches most closely approximate the properties of casein.

Figure 3 shows the pick tests for various starch products of comparable fluidities. It is obvious from this, that chlorinated starches (chlor gums) have distinctly higher bonding strengths than the other types of starches. Further it is well known that the curve for casein would fall somewhat to the left of that for chlorinated starches, i.e. close to the Y-axis or the pick test line. Thus the chlorinated starches approach the strength properties of casein to a greater degree than the other types; and it is to this class of product that your attention should be directed in considering replacement.

Figure 4 indicates that from the standpoint of resisting the penetration of inks, these chlorinated starches are also most favorably located; suggesting a more uniform distribution of starch throughout the coating. This belief is supported by the fact that these products are not generally associated with dusting difficulties and possess the best machining properties. Here also the casein curve would fall near the Y-axis, i.e. nearest the curve for chlorinated starch.

Conclusions

With the proper selection of modern coating formula, finished starch coatings can be obtained that are substantially equal to casein coatings in every commercial respect except waterproofness.

The chlorinated starches (chlor-gums) approach casein in properties more closely than the other types of starches.

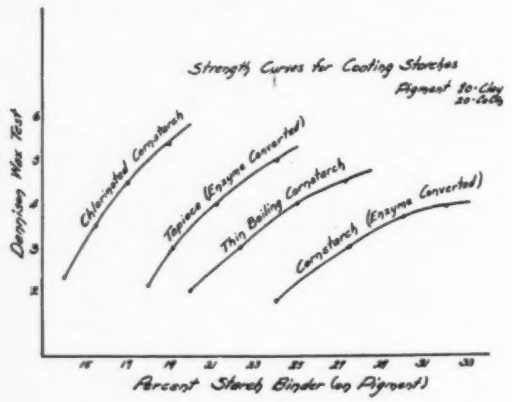


FIG. 3

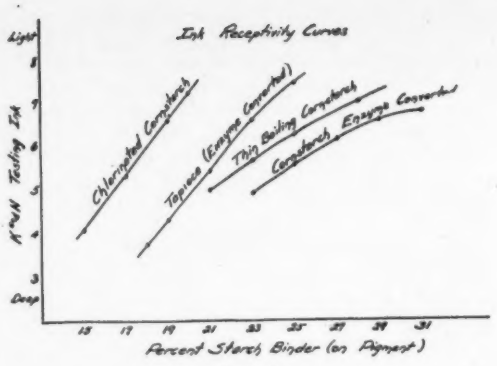


FIG. 4

Acknowledgment

To R. K. Britton of our technical service department, I wish to express my appreciation for his valuable assistance in the preparation of this paper.

Plastic Corp. Issues Sample Book

BOSTON, Mass., July 14, 1941—The Plastic Coating Corporation, Holyoke, Mass., whose products are distributed by Henry L. Goodman, Boston, has issued a book containing swatches of Kivar No. 5, a superb imitation leather product, in standard colors and two-tone finishes. The swatches include standard base colors in Llama, Morocco, Crush, Levant, Skiver and Box Calf grains, as well as 60 suggestions of two-tone finishes. The leather finish is made of the finest materials available and the surface wearing qualities are equal to cloth fabric base materials. The surface is thoroughly waterproof and may be washed with soap and water. Kivar No. 5 is especially suitable for purposes where an economical and durable leather finish is desired. The colors are very fast to light and the metallic finishes will neither rub nor tarnish. Kivar No. 5 is ideal for dual-purpose gift cases, leather novelties, box coverings, luggage linings and coverings, turned edge work, bookbindings, and card table covers.

Paper and the National Emergency

BOSTON, Mass., July 14, 1941—"How the National Emergency is Affecting the Paper Industry" is the subject to be discussed at a meeting of the members of the New England Paper Merchants Association, Inc., and other members of the paper industry in New England. This meeting, sponsored by the National Paper Trade Association, Inc., is to be held in the Boston Chamber of Commerce Building at 7 P. M., Monday, July 21.

The speakers will be Charles W. Boyce, former secretary, American Pulp and Paper Association, now serving as assistant chief consultant, Pulp and Paper Unit, O. P. M., in Washington, and Robert H. Zeigler, assistant secretary, National Paper Trade Association, New York City.

* A. E. Hughes and H. F. Roderick—Paper Trade Journal, February 22, 1940.

Government Paper Bids and Awards

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., July 16, 1941—The following paper awards have been announced by the Government Printing Office.

Whitaker Paper Company will furnish 2,419 pounds of various color, 19 x 24 sulphite bond paper at $411.29. Paper Corporation of U .S. will furnish 35,100 pounds of 50% rag, 38 x 48 white ledger paper and 40,125 pounds of same 32½ x 42 at 11.13 cents. Same firm will also furnish 44,400 pounds of 24 x 38 H.F. sulphite manila tag board at 6.24 cents. R. P. Andrews Paper Company will furnish 35,000 pounds of 29 x 41 coated book paper at 8.02 cents. Bids for all of these items were received on June 13.

Paper Corporation of U. S. will furnish 115,000 pounds of 24 x 38 offset book paper at 6.94 cents. Same firm will also furnish 23,749 pounds of 50% rag, 17¼ x 23 buff ledger paper at 11.63 cents. Same firm will also furnish 36,720 pounds of 40 x 42 white sulphite writing paper. R. P. Andrews Paper Company will furnish 48,000 pounds of 38 x 50 supercalendered book paper at 5.94 cents. Bids for all of these items were received on June 11.

Paper Corp. of U. S. will furnish 38,500 pounds of 38 x 48 offset book paper at 6.85 cents. Same firm will also furnish 48,000 pounds of 25 x 38 offset paper at 6.37 cents. R. P. Andrews Paper Company will furnish 5,000 pounds of rope manila paper in 48" rolls at 19.5 cents. Same firm will also furnish 71,460 pounds of 100% rag, 35 x 46 white chart paper and 83,880 pounds of same 30 x 42 at 8.47 cents. Bids for these items were received on June 9.

Paper Corporation of U. S. will furnish 15,183 pounds of 50% rag, 32 x 42 white index paper at 10.7 cents, bids for which were received on June 6.

Stanford Paper Company will furnish 44,400 pounds of 50% rag, 26 x 38 lithograph finish map paper at 12.6 cents. Paper Corporation of U. S. will furnish 9,600 pounds of 24 x 36, No. 1 kraft flat paper at 7 cents. Marquette Paper Company will furnish 80,000 pounds of white sulphite writing paper in 25½ inch rolls at 6.86 cents. Frank Parsons Paper Company will furnish 346,000 pounds of 38 x 48 supercalendered book paper at 6.069 cents. Bids for these items were received on June 4.

Old Dominion Paper Company will furnish 14,400 pounds of 100% rag, 17 x 22 white bond paper at 19.847 cents. Mudge Paper Company will furnish 20,508 pounds of 25% rag, 45¼ x 65¼ white bond paper at 10.36 cents and the same firm will also furnish 12,199 pounds of same 44 x 62 at 12.65 cents. R. P. Andrews Paper Company will furnish 61,000 pounds of 28 x 34 white sulphite writing paper at 7.29 cents. Mudge Paper Company will furnish 2,348 pounds of 32 x 42, 50% rag, blue bond paper at 19.46 cents. Bids for all of these items were received on June 2.

PAPER BIDS

Government Printing Office has received the folfowing bids for 86,000 pounds of 20 x 25 tan bristol board, cellulose coated and 130,400 pounds same 25 x 38; R. P. Andrews Paper Company, $8.04 per C sheets.

For 86,000 pounds of same 20 x 25 uncoated and 130,400 pounds same uncoated 25 x 38; R. P. Andrews Paper Company, 11.05 cents and Paper Corporation of U. S., 10.75 cents.

Rayonier Makes Exhibits

The accompanying illustration represents large show cases maintained in the reception room of Rayonier Incorporated's New York Office.

With the exception of the rug sample containing a percentage of staple fiber and the blanket containing 88% of staple fiber in which dissolving pulps were used, the finished articles in the show case were contributed by Rayonier's paper pulp customers. These give a general idea of the diversification of

ARTICLES MADE FROM RAYONIER PULP

articles produced from part furnish or 100% of various types of paper and specialty pulps manufactured by Rayonier.

These exhibits, which are revised twice a year, and to which Rayonier's customers are invited to submit articles of interest to the general public, are both educational and interesting. Many requests are received from visitors as to where certain articles may be purchased.

A similar exhibit is maintained in Rayonier's Fernandina Office.

The section of wood on top of the show case represents twenty-year growth of Southern Pine.

Walker-Goulard-Plehn Hold Outing

The 9th annual outing of the Walker Goulard Plehn Company, Inc., was held on June 28, 1941, at Narragansett Inn, Lindenhurst, Long Island. Favored with exceptionally fine weather, the largest crowd ever to attend this affair participated in the festivities.

After a splendid shore dinner, the assemblage was addressed by the officers of the company and at the suggestion of the president, Thomas Goulard, the sum of $40.00 was raised for the U. S. O.

The game period consisted of a nail driving contest, a basket pitch and a horseshoe pitching contest for the men and the ladies whiled away the hours by participating in a dart throwing contest, a potato race and a rolling pin throwing contest. Two soft ball games were played. The Export Department won the opener, but dropped the nightcap to the visitors in a hotly contested game.

At supper, door prizes were awarded to Harold Burke and Elwin Walker. Dancing and impromptu exhibitions continued until the wee hours of the morning.

CONSTRUCTION NEWS

Columbus, Ohio—Columbus Paper Box Company, Inc., 344-52 West Town street, manufacturer of stiff folding paper boxes and containers, has approved plans for new addition to plant, consisting of a two-story structure, 40 x 130 feet, to be used for expansion in production department. Cost reported close to $60,000, with equipment. General erection contract has been let to E. Elford & Son, 555 South Front street, Columbus, and work is scheduled to begin at once.

Menasha, Wis.—The Marathon Paper Mills Company, Menasha Products Division, manufacturer of waxed paper stocks, etc., has awarded general contract to the Edward H. Meyer Construction Company, 75 Main street, Oshkosh, Wis., for new one-story addition, about 20 x 53 feet, for expansion in tank house. No estimate of cost announced. An award for reinforcing steel has been let to the Bethlehem Steel Company, Milwaukee, Wis., and for sheet metal work, to the Valley Sheet Metal Works, Neenah, Wis. Erection will proceed at early date.

Cloquet, Minn.—The Wood Conversion Company, manufacturer of insulating board, building board, etc., has superstructure in progress for new addition to mill for expansion in dryer department, as well as other production divisions. It will be one-story, about 58 x 315 feet, and is reported to cost close to $100,000, including equipment. Progress in erection recently was delayed owing to difficulty in securing structural steel framing required for structure. Thomas J. Shefchik, Lonsdale Building, Duluth, Minn., is architect.

Perth Amboy, N. J.—The Continental Container Corporation, 35 Steuben street, Brooklyn, New York, manufacturer of corrugated boxes and containers, has completed arrangements for the purchase of a three-story industrial building on Rector street, Perth Amboy, previously owned by E. I. duPont deNemours & Company, Inc., Wilmington, Del., and occupied for storage and distribution service by its R. & H. Chemicals Division. The building totals about 120,000 square feet of floor space and will be used by the Continental company for its main plant in the future. Improvements will be made and equipment installed at early date. It is proposed to remove the present Brooklyn plant to new location and provide facilities for increased production, with facilities for employment of over 400 persons in near future. The acquisition also includes a garage building of about 10,000 square feet of floor space, and which will be converted for company use. It is understood that the Scandore Paper Box Company, Inc., Brooklyn, address noted, an associated interest, likewise will remove its plant to the new location, developing enlarged output for the manufacture of stiff paper boxes, etc. This is the second plant unit to be located by the Continental company at Perth Amboy; as previously noted in these columns, company recently took over the former factory of the Bayuk Cigar Company on Neville street, and has removed a former branch at Lansdale, Pa., to that location, where full production is now in progress. It is said that with the removal of plant from Brooklyn, the Neville street branch will carry out expansion and add to present working quota. Emil Scandore is president of all companies noted, and Frank Scandore, vice-president.

Coshocton, Pa.—The Muskingum Fiber Products Company, manufacturer of fiber specialties, has plans nearing completion for new addition to mill, to be one-story, reported to cost over $40,000, with equipment. Company also will make alterations and improvements in present plant. Proposed to begin work at early date. Fred Jacobs, Coshocton, is architect.

Chicago, Ill.—The United Wall Paper Factories, 3330 West Fillmore street, wall paper products, has arranged for lease of four-story building at 3920-42 Federal street, for a term of years, and will take immediate possession. The structure totals about 76,000 square feet of floor space. It will be improved and occupied for new storage and distributing building.

Holyoke, Mass.—The National Blank Book Company, foot of Appleton street, manufacturer of commercial paper products, has awarded contract to the Bathelt Construction Company, 380 High street, for improvements in plant. No estimate of cost has been announced. Work will be placed under way at once.

St. Louis, Mo.—The American Can Company, 230 Park avenue, New York, N. Y., plans installation of a department for the manufacture of fiber boxes and containers in proposed new plant on South Kingshighway, in vicinity of Juniata street, St. Louis, where tract of about 30 acres of land has been secured. Division will be equipped for large capacity and will be developed as a primary operating department of plant. New factory will be one-story, totaling about 500,000 square feet of floor space, with complete project, including metal container section, estimated to cost close to $2,000,000, with equipment. Present structures on site will be razed at early date and erection of new units placed under way. C. G. Preis is company engineer in charge, first noted address.

Kimberly, Wis.—The Kimberly-Clark Corporation, Neenah, Wis., manufacturer of writing, book and other paper stocks, has superstructure under way on new one-story addition to mill at Kimberly, recently referred to in these columns and will push erection to early completion. Building will be about 67 x 160 feet, and will be used for storage and distributing service. Miscellaneous contracts for completion are being awarded, including plumbing, painting, etc. It is reported to cost over $40,000, with equipment. The Fluor Brothers Construction Company, 48 Otter street, Oshkosh, Wis., has the general erection contract.

North Tonawanda, N. Y.—Greer Brothers, Walck road, North Tonawanda, manufacturers of wood fiber products, are planning to lease local property for new plant, to replace factory on Walck road, recently destroyed by fire, with loss reported close to $50,000, with equipment. It is understood that rebuilding is planned, with immediate new works noted to provide partial production until reconstruction has been completed. Frank E. Geer is one of heads of company.

New York, N. Y.—The State Container Company, 405 West Thirty-sixth street, manufacturer of corrugated boxes and containers, has leased the six-story and basement building at 449-51 West Thirtieth street, totaling about 35,000 square feet of floor space, and will occupy for plant. Present factory will be removed to new location and increased capacity carried out. It is proposed to take possession of building at new location at once.

Austin, Pa.—In accordance with instructions from Judge Robert F. Lewis, Federal Court, Coudersport, Pa., Walter J. Phillips, receiver for the Bayless Pulp & Paper Corporation, with mill at Austin, will receive bids for the property in whole or in part until July 31. The plant has specialized in the manufacture of waxed and other processed paper stocks, imitation parchment and kindred papers. It has been operating under receivership since July 1933, and production at the mill was discontinued in September 1940.

New Companies

New York, N. Y.—The Whiteford Paper Company, Inc., has been incorporated with capital of 200 shares of stock, no par value, to deal in paper products of various kinds. New company is represented by Mulligan & Hill, 20 Exchange place, New York, attorneys.

New York, N. Y.—The Accurate Paper and Twine Company, Inc., has been organized with capital of $15,000, to deal in wrapping papers and kindred paper stocks. New company is represented by Herman Chaityn, 11 West Forty-second street, New York, attorney.

New Haven, Conn.—The Merit Paper Box Company, Inc., 58 Hamilton street, has been organized to manufacture and deal in paper boxes and containers. Salvatore DiBenedetto is president; and Paul Brown, secretary and treasurer.

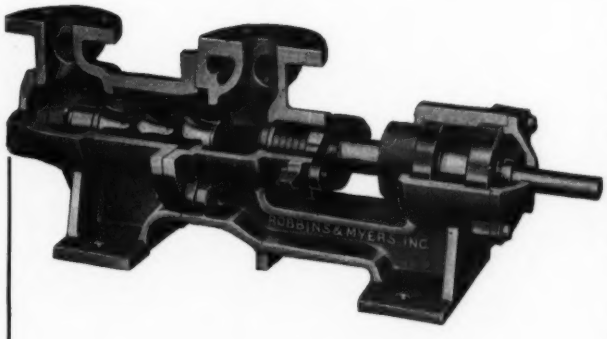
New York, N. Y.—Bronx Farmer Supply, Inc., Bronx, has been chartered with capital of 200 shares of stock, no par value, to deal in paper boxes and containers, cartons, paper bags, etc. New company is represented by Herbert Cohen, 347 Madison avenue, New York, attorney.

"Hands Across the Border"

"Hands across the border" is the theme of this float seen this summer in Minneapolis during the Aquatennial, 10-day civic festival. Sponsored by the

Minnesota and Ontario Paper Company and its Insulite division, the float typifies friendship between the United States and Canada, in which are located plants of the company at Kenora and Fort Frances, Ont., and at International Falls, Minn.

R & M MOYNO SLIP PUMPS
Serve Leading Paper Mills...



Improved paper quality . . . lowered maintenance costs . . . trouble-free service! These are actual performance records of R & M Moyno Slip Pumps in 20 leading paper mills operating from 1 to 17 pumps each.

There are no valves or pistons to stick, leak, clog or wear out. Slip is forced gently and uniformly to the coating rolls . . . without foaming, turbulence or cavitation.

The pumping operation is simple. An eccentric rotor revolves within a double-threaded helical stator. Action is like a piston moving continuously through a cylinder of infinite length.

R & M Moyno Slip Pumps can help *you* produce a finer product . . . and save money. Mail a post card or letter now for complete details.

ROBBINS & MYERS • Inc.
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FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for Week Ending July 16, 1941

	High	Low	Last
A. P. W.	1½	1½	1½
Armstrong Cork Co.	30	29	29⅝
Celotex Corp.	9½	9⅛	9⅜
Celotex Corp., pf.	71	70	70
Certain-Teed Products Corp.	3¼	3¼	3¼
Certain-Teed Products Corp., pf.	34¾	32	32
Champion Paper & Fibre Co.	21½	20	21
Champion Paper & Fibre Co., pf.	103	101¾	103
Congoleum-Nairn Co.	17	16	16⅝
Container Corp. of America	16¼	15¾	16
Continental-Diamond Fibre Co.	8¾	8½	8¾
Crown-Zellerbach Co.	14⅛	13⅝	13⅝
Crown-Zellerbach Co., pf.	86¾	86	86
Flintkote Co.	15½	14⅞	14⅞
Robert Gair	2⅛	2	2
Robert Gair, pf.	9⅞	9¾	9¾
International Paper & Power Co.	18¼	16¾	17¼
International Paper & Power, pf.	69¼	67	67
Johns-Manville Corp.	68½	66½	66⅝
Johns-Manville Corp., pf.	125¼	125¼	125¼
Kimberly-Clark Corp.	29½	28¼	29
Masonite Corp.	24¼	23¾	24
Mead Corp.	9⅝	9¼	9¼
Mead Corp., pf.	82	81	81¾
Paraffine Companies, Inc.	30	30	30
Paraffine Companies, Inc., pf.	99	98	99
Rayonier, Inc.	15¼	14⅛	14⅛
Rayonier, Inc., pf.	28¼	25	28¼
Ruberoid Co.	18¼	17⅝	17⅝
Scott Paper Co.	35⅜	35¼	35¼
Scott Paper Co., pf.	113	111	113
Sutherland Paper Co.	21½	20½	21½
Union Bag & Paper Corp.	12¼	11⅝	12
United Paperboard Co.	4⅛	3⅜	3⅞
U. S. Gypsum Co.	59⅜	58½	58½
U. S. Gypsum Co., pf.	177	175½	175½
West Virginia Pulp & Paper Co.	20⅞	19½	20½

New York Curb Exchange

High, Low and Last for Week Ending July 16, 1941

	High	Low	Last
American Box Board Co.	5⅝	5⅛	5½
Brown Co., pf.	20	18¼	20
Great Northern Paper Co.	37½	36⅞	36⅞
Hummel-Ross Fibre Corp.	6⅜	6	6¼
National Container Corp.	12¼	12	12¼
St. Regis Paper Co.	2¼	2⅛	2¼
St. Regis Paper Co., pf.	99½	96½	96½
Taggart Corp.	2¾	2½	2¾

St. Regis to Reduce Assets

A special meeting of stockholders of the St. Regis Paper Company will be held in Watertown, N. Y., on July 31, to consider action taken by the board of directors at a meeting on June 26 authorizing restatement of the value of certain investments retroactive to Jan. 1.

The investments of the company include 1,341,666 common shares of the United Corporation of Delaware, being the balance of 2,070,000 acquired in 1931 through an exchange of the entire holdings of St. Regis in common stock of the Niagara Hudson Power Corporation. In the intervening period 728,334 shares of United Corporation common stock were sold by St. Regis Paper on the New York Stock Exchange.

Total valuation of the 1,341,666 common shares of United Corporation on the books of St. Regis Paper is $16,553,504, or the original cost or company valuation of the shares. The market value of this investment on Dec. 31 last was $1,845,000.

Roy K. Ferguson, president, said market quotations for these shares did not necessarily indicate the intrinsic worth or actual value of the investment, but that market value should be considered in determining the amount that the company might expect to realize in the event of a sale of all or part of such investment.

Accordingly, he said, the directors had decided that the investment in common stock of the United Corporation should be restated at $1,845,000, which would be reflected in charging to earned surplus the full amount of the depreciation and to capital surplus the earned surplus deficiency created.

Likewise, the company's holdings of 230,000 common shares of the Taggart Corporation, acquired from 1928 to 1930 in part for cash and in part in exchange for certain other shares and carried at $5,642,844 cash or company valuation, would be restated at $1,295,000. Similar revaluation is proposed for 3,600 common and 4,056 Class B preferred shares of the Carthage National Exchange Bank, acquired in 1934 for $220,560 in cash and carried at that sum, to be restated at a nominal amount of $1.

The aggregate amount of the investments to be affected by the voting is $22,416,908. The restated valuation is $3,140,001, or a depreciation of $19,276,907. This would eliminate the earned surplus of $2,330,583 and reduce capital surplus from $21,347,426 to $6,015,124 as of Jan. 1 last.

To Pay Interest in Stock

TORONTO, Ont., July 14, 1941—Consolidated Paper Corporation, Ltd., has notified the Montreal Curb Market that during June the company issued in payment of interest 1,117 shares of the company's capital stock, making a total of 2,554,319½ shares outstanding.

Consolidated's 5½% debentures of 1961 quoted July 10 here at 68½ are not far from their level of a month ago when they were quoted "flat." A year's interest was paid in cash for the first time July 2. The bonds are now quoted on the regular "and interest" basis, and interest becomes a regular mandatory fixed charge, the next semi-annual coupon falling due Jan. 2, 1942.

Having regard to indications that 1941 earnings are running at about the same rate in 1940, another sinking fund payment is likely. Terms are that 25% of the previous year's net earnings is payable under sinking fund on March 1 each year, providing working capital is not reduced below $10,000,000. Should the markets for newsprint and pulp remain much as they are now for several years to come, the company's position would be materially strengthened.

Mead Earns $404,321

The Mead Corporation, Chillicothe, Ohio, has reported a consolidated net profit of $404,321 for three four-week periods ended on June 14, equal to 48 cents a common share, against $324,020 or 36 cents a share a year before. For six four-week periods ended June 14, the profit was $776,358 or 89 cents a share, compared with $681,531 or 76 cents in 1940.

Champion Nets $3.37

The Champion Paper and Fiber Company and subsidiaries for the 12 months ended April 27, 1941,

reports a net income of $2,379,660 after taxes and charges, equal after preferred dividends to $3.37 a share on 550,700 common shares; year ago $1,731,937 and $2.24 a share.

Puget Sound Earnings Up

The Puget Sound Pulp and Timber Company, for the six months ended June 30, reports an estimated net income of $650,000, or $2 a common share; for like 1940 period, $618,143, or $1.81 a share.

I. P. Holds Southern Kraft Stock

When Southern Kraft Paper Corporation was organized June 2, 1941, all of its stock was owned by Southern Kraft Corporation. Southern Kraft Corporation was, however, merged into International Paper Company June 23, 1941, so that the latter is now the holder of the stock of Southern Kraft Paper Corporation.

On June 9, 1941, Southern Kraft Paper Corporation acquired from Southern Kraft Corporation the paper towel and tissue mills at York Haven, Pa., and Marinette, Wis., and the jute board mills at Spring Garden, Pa.; Hartford City, Ind.; Rockford, Ill.; and Cincinnati, Ohio; together with minor miscellaneous properties. Southern Kraft Paper Corporation is not itself currently operating any mills, as all the above-mentioned mills have been leased to International Paper Company.

Thomas B. McCabe Made Chairman

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., July 14, 1941—In an effort to determine the methods of mitigating dislocations of normal peace-time industry, both during the defense effort and in the re-adjustment period when it is over, the National Association of Manufacturers has started a survey, and has appointed Thomas B. McCabe, president of the Scott Paper Company, Chester, Pa., chairman of the association's economic group.

In accepting the chairmanship of the association's committee on economic policy, Mr. McCabe said: "It is not at all improbable that hundreds or thousands of manufacturing plants will be shut down within the year unless they are able to convert their production to defense work."

The committee held its first of a series of private discussion meetings with industrialists and economists and plans, Mr. McCabe explained, "to make suggestions for meeting the problems in a manner which will best serve the interests of consumer, labor and employer. The committee," continued Mr. McCabe, "is particularly interested in the economic aspects of current defense production as it relates to the post-armament situation which may exist, those violent dislocations which are occurring today and may increase in the near future."

Vice-chairmen of the committee, composed of sixty-three members, are Stuart W. Cramer, Jr., president, Cramerton Mills, Cramerton, N. C.; Malcolm Muir, president and publisher of Newsweek magazine, and Roy E. Tomlinson, president, National Biscuit Company. S. Bayard Colgate, chairman of Colgate-Palmolive-Peet Co., heads a subcommittee on distribution of income, and John Airey, president, King-Seely Corp., Ann Arbor, Mich., one of economic aspects of defense.

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Obituary

Max T. Hartley

Max T. Hartley, 78, vice-president of The Sorg Paper Company, Middletown, Ohio, with which he had been associated since 1899, died Friday morning, June 27, 1941, from effects of injuries suffered the previous morning when his car plunged into a creek while driving to his home in Franklin, Ohio.

Death occurred in the Middletown Hospital where he had been removed for treatment of multiple injuries including hip fracture, vertebrae fracture, concussion and internal injuries. Shock attendant to the incident was a contributing cause to death, his physician reported.

Prior to becoming associated with The Sorg Paper Company, Mr. Hartley was connected with the Friend-Forgy Paper Company and the Jacoby Paper Company, predecessors to the Paul A. Sorg Paper Company which later merged with other interests and became the Sorg Paper Company. He became treasurer of the Sorg firm in December 1899 and later served as secretary-treasurer for a period before being named vice-president. Mr. Hartley continued active until two years ago when ill health caused him to relinquish his official duties.

Survivors are his widow, two sisters and a niece. Funeral services were private.

Francis A. O'Neill

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., July 14, 1941—Francis A. O'Neill, president of the Paper Manufacturers Company, 5th and Willow streets, since he founded the concern in 1907, died on Saturday last at his home, 420 Vernon road, Jenkintown, after five weeks' illness. He was 60.

Mr. O'Neill was interested in many Catholic charities, including the Gonzaga and St. Joseph's orphan asylums. He was also a member of the Knights of Columbus, and a former president of the Philadelphia Paper Trade Association.

Surviving him are his wife, Mary; two daughters, Mrs. Lucy T. Cook, Chestnut Hill, and Mrs. Margaret M. Euler, Jenkintown; and two sons, Francis A. Jr., Rydal, and Louis A., Wyncote.

Solemn requiem Mass will be celebrated at the Immaculate Conception Church, Jenkintown, tomorrow, at 10 A.M. Interment will be in Holy Sepulchre Cemetery.

Richard T. Stevens

Richard Tracy Stevens, president and a founder of the Japan Paper Company, importers and exporters, at 109 East Thirty-first street, New York, died of a coronary thrombosis July 12 in his Summer home at Lake Waccabuc, near South Salem, N. Y. His age was 76. He resided at the Hotel Grosvenor, 35 Fifth avenue, New York.

Mr. Stevens, who had traveled extensively in Japan and Korea, was a descendant of the family that founded Yale College and of Jonathan Edwards, Puritan divine of the eighteenth century. He was a vestryman of Grace Episcopal Church, New York, and treasurer of the New York Episcopal Training School for Deaconesses.

He leaves a widow, Mrs. Georgianna Hand Stevens, who is a cousin of Federal Judge Augustus N. Hand.

Ship Snyder Machinery to India

[FROM OUR REGULAR CORRESPONDENT]

COHOES, N. Y., July 14, 1941—Announcement is made here of the sale of the W. W. Snyder Manufacturing Company to the Orient Paper Company, of Calcutta, India, and the dismantling of the plant is already under way. All equipment used in the production of boxboard or cardboard will be shipped to Calcutta, the task of dismantling requiring several weeks. The equipment will fill about ten railroad cars and will be shipped to India by way of the Panama Canal. The transaction was arranged through the Sandy Hill Iron and Brass Company, of Hudson Falls, who appeared as brokers. The Snyder concern was represented by Wertime & Wertime, of this city, while the firm of Singleton & Singleton represented the Orient Paper Company. The amount involved in the transaction was not made public. With completion of negotiations for the sale the local concern was allowed sufficient time to run off orders which were on hand. Until the time of the sale the concern had been working three shifts daily and employing about sixty hands. The Orient Paper Company is reported to have made similar machine purchases on a large scale both in this country and Canada.

No Water Power Shortage Likely

MONTREAL, Que., July 14, 1941—While no shortage of hydro-electric power for pulp and paper production is looked for, methods are being studied to further restrict its use for non-essential purposes, particularly in the domestic household field. Net firm power consumption in Canada is now at the highest peak in history. The output of the central stations in May reached an all-time high of 805,000,000 k.w.h., and for the first five months of 1941 net firm power consumed was 2,205,000,000 k.w.h., which was 16.7% greater than for the like period of 1940. Reports of power to the United States, mainly for use in the aluminum industry, totaled 993,000,000 k.w.h. for the same five months, as compared with 808,000,000 k.w.h. in the five months ending May, 1940.

Pennaconn Co. to Start Mill

MANCHESTER, Conn., July 14, 1941—Another new firm, the Pennaconn Paper and Plastics Company, will locate in Manchester, according to a certificate filed with Town Clerk Samuel J. Turkington.

According to Judge William S. Hyde, who filed the certificate for D. C. Giles of Oil City, Pa., the company will locate in a mill in Oakland formerly occupied by the American Writing Paper Company.

The mill, sold recently by Manhattan Raybestos Company, was built shortly after the Civil War by Philip Hudson.

California Company to Build

In the issue of the PAPER TRADE JOURNAL of July 10, 1941, it was stated that the Philadelphia Quartz Company, Philadelphia, was building a plant at Tacoma, Wash. This was incorrect as the plant will be built by the Philadelphia Quartz Company of California, Ltd., Sixth and Grayson Street, Berkley, Cal.

Indianapolis Active

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., July 14, 1941 — Mid-summer and hot weather has had no effect on diminishing the volume of paper and paper products being sold in this section this year. Not only does demand continue extremely heavy for all lines, but prices are slowly, but surely increasing, in spite of all efforts to call a halt. One of the concerns of the local trade is to prevent anything like a runaway market. The price level is considerably higher than it was this time a year ago and before the end of the year likely will be yet higher. Demand is far beyond that of last year and if it continues, it is probable 1941 will be the biggest volume year the trade ever has seen.

Much of the demand is due directly, or at least indirectly to the defense program. This is particularly true in converted items and in heavy wrapping paper. Kraft is increasingly hard to get and many local paper men predict an acute shortage before the mills can secure sufficient raw products to meet the demand. The paper board market seems better stabilized, insofar as price is concerned, than most other lines, due to recommendations for maximum prices by government officials.

Fine papers are moving nicely with volume very large for this time of year. Local printing plants are working far better than usual and orders are in prospect for a heavy fall business. Inquiries for fine papers are numerous and there is a well defined opinion that prices will continue their slow upward movement.

Building papers lead the list in volume. This has been true since the first hint of spring and from all indications will continue until mid-winter. New construction here is far ahead of last year, which was no small building year. Dealers have fair stocks, but demand is forcing them into the market regularly.

Paper stock demand is good and prices fairly steady. Local paper stock executives are prepared to cooperate whole-heartedly in any movement to establish a voluntary price level at reasonable quotations. No particular change is seen in the rag market here. A steady demand for all grades continues. Roofing grades are active, but prices show little variation.

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Buys Paper Under Walsh-Healey Act

WASHINGTON, D. C., July 16, 1941—During the week ended June 28, $276,161.84 worth of paper and allied products were purchased under the Walsh Healey Act by various government departments according to the Public Contracts Board.

These purchases included: $12,948.00 worth of bond paper for the GPO by Stanford Paper Company; $22,970.20 worth of paper for the QMC, War, Chicago by Paper Corporation of U. S.; $34,586.94 mimeograph paper for QMC, War, Indianapolis by Cincinnati Cordage & Paper Company; $38,973.75, envelopes, GPO, by Oles Envelope Company; $61,-724.50, envelopes GPO by Commercial Envelope Company; $12,085.45 envelopes, Dayton Envelope Company; $73,073.00 envelopes, for GPO, United States Envelope Company; and $19,800.00 gridded paper, War, Eng. D. C., by J. H. Weil & Co.

PAPER TRADE JOURNAL

Title Reg. U. S. Pat. Off.

Henry J. Berger

EDITOR

Vol. 113 July 17, 1941 No. 3

COMING EVENTS IN PAPER INDUSTRY

NEW ENGLAND SECTION. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

DELAWARE VALLEY SECTION. Technical Association of the Pulp and Paper Industry—First Friday of each month at the Engineers Club, Philadelphia, Pa.

LAKE STATES SECTION. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

KALAMAZOO VALLEY SECTION. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, Fall Meeting, Ann Arbor, Mich., September 16-19.

NATIONAL PAPER TRADE ASSOCIATION, annual Fall Meeting, Stevens Hotel, Chicago, Ill. September 15-17.

INFLATION

Inflation in a somewhat different form than that caused by the former world conflict is seen by some economists as impending. The basic element in the inflation that now threatens to make substantial changes in the controlled economy plans of the Administration is not of the printing press variety common during the last world conflict. The same danger lies in the huge public expenditures. The demand for goods and the prospect of a diminishing supply inadequate to absorb the requisite buying power of the nation is just now the cause of concern. The controlled economy which the Administration had set up through the establishment of price administration and supply bureaus, may now fail to function to keep prices down. The prospect is that the authority of the Price Administrator, Leon Henderson, is almost certain to be increased in an effort to keep the highly inflationary situation in hand.

In some respects, economists point out, the inflation now feared is similar to that which finally advanced American prices rapidly to a fantastic peak in 1920. At that time, world-wide prices continued reasonable into 1916, then advanced rapidly and continued very high for four years. At the peak, general prices were about 145% higher than the normal level and the cost of living went up to 106%. One practical result of this high price rise was reflected in the purchasing power of the dollar, since it required two dollars to purchase what had formerly cost one dollar. In comparing the inflated price level created by the former European conflict with prices today, it may be noted that in the first 22 months of the current conflict general wholesale commodity prices have advanced 13% and the trend continues definitely upward. Prices of agricultural products, that is food, show the most rapid rise, with an advance of 24%, while at a comparative period in the former conflict farm prices were only 8% higher. In referring to the commodities which are commonly influenced most by inflationary forces, we find that the level is now 50% above the normal level prior to September 1939.

A considerable degree of inflation is expected and is viewed as desirable to stimulate general business activity, and the Administration is considered reasonable by even its critics in its desire to increase farm prices and wages to bring up the low level formerly prevailing to strike a better balance with industrial prices and wages. Now that farm prices are beginning to move up at too fast a pace, anxiety is felt that the cost of living may advance too high and so occasion real hardship in general. Inflation is, as economists have consistently explained for many months, extremely difficult to control. To the wage earner it means that while wages increase, prices advance more rapidly and while he has more dollars to buy goods, he can obtain less and less for his dollar. The salaried worker, whose earned income remains more or less stationary, is placed in even a more difficult situation, and must eventually adopt a lower standard of living to keep out of debt and live within his means.

The Administration will, it may be presumed, adopt even drastic means to control excessive inflation. The adoption of a "price ceiling" is in theory an easy and effective means to control prices. But actually it is extremely difficult to accomplish it. To control prices it is also necessary to control the important factors which actuate prices, such as wages. Labor, would, it may be assumed, vigorously object to that drastic measure, and the attempt to control retail prices would be a task of such magnitude that it would seem impracticable. It would entail, for example, a check on millions of individual sales. Thus, the methods now in effect to control prices depend for their success upon the cooperation of all parties concerned and this is perhaps too much to be expected. It therefore appears inevitable that any effective system of price control must take into consideration the control of income. The Government can do this by increasing taxes to absorb the excess of purchasing power.

The prospect that the Adminstration will resort to actual price fixing, as used in Germany, for example, is not viewed as likely now. And even in Germany today where the most absolute control of prices is in effect, price fluctuations brought about by varying qualities in goods and by bootlegging are common. The defense expenditures are steadily increasing and the factors which contribute to inflation continue to become more and more active. The prospect for the future of keeping a reasonably well balanced economy is not very bright. The use of priorities and the curtailment of goods for civilian use is an important factor working to increase inflation. A solution for

this difficult problem may be found, but at the present time no advocacy for the drastic measures apparently required to stem the rising tide of inflation seems likely to be adopted by Congress.

In the meantime, it would seem inevitable that the purchasing power of the dollar will continue to steadily decrease in direct ratio to the continuation of the European conflict and our economic participation in it. This also means that the value of fixed income securities, such as bond yields, will continue to decline, while common shares will tend to increase in value. The unwise and short-sighted fiscal policies of the Administration must be changed to check instead of encourage inflation and a practical scheme of taxation in the interests of the prosperity of the entire country must finally be adopted to assure permanent prosperity and avoid so far as possible hardships which must come later in the readjustment of the national economy with world economy after the conflict is terminated.

Statler Gets Big Order for Tissue

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., July 14, 1941—A government order for 8000 cases of tissue has been placed with the Statler Toilet Tissue Company, to be distributed among army camps, according to an announcement made by E. E. Peterson, general manager, Statler Toilet Tissue Company, Somerville, Mass.

At the same time, a wage increase of 10 per cent to factory employees was announced.

Production Ratio Report*

(Production as per cent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

Current Weeks, 1941		Corresponding Weeks, 1940	
May 31	97.1	June 1	87.6
June 7	98.1	June 8	91.3
June 14	99.3	June 15	91.9
June 21	99.7	June 22	93.1
June 28	101.3	June 29	92.0
July 5 (Prelim.) (Holiday Week)	*75.0*	July 6	69.0

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1940	89.1	84.7	82.3	84.3	90.0	92.1	85.3
1941	85.6	89.4	92.3	96.4	98.9	*99.8*	...

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1940	85.1	81.5	85.5	84.9	80.9	85.6
1941	...	...	...	...	...	...

COMPARATIVE YEARLY SUMMARIES

	1935	1936	1937	1938	1939	1940	1941
Year to Date..	68.1	77.6	88.1	67.1	78.6	86.6	*92.9*
Year Average..	69.9	80.4	79.8	71.5	83.4	85.6	...

* Based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

PAPERBOARD OPERATING RATIOS†

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1936	62	67	67	70	69	70	69	75	78	82	80	74	72
1937	80	86	86	88	85	77	66	74	69	65	55	45	73
1938	54	60	61	57	58	56	57	66	66	70	65	59	61
1939	60	67	71	69	64	67	63	72	74	84	81	71	70
1940	71	70	69	70	76	79	72	74	72	79	77	71	73
1941	75	81	82	83	84	*88*	..	..	..	..	..	..	..

Week ending May 31, 1941—84
Week ending June 7, 1941—84
Week ending June 14, 1941—88
Week ending June 21, 1941—88
Week ending June 28, 1941—90
Week ending July 5, 1941—*74*

† Per cents of operation based on "Inch-Hours" reported to the National Paperboard Assn.

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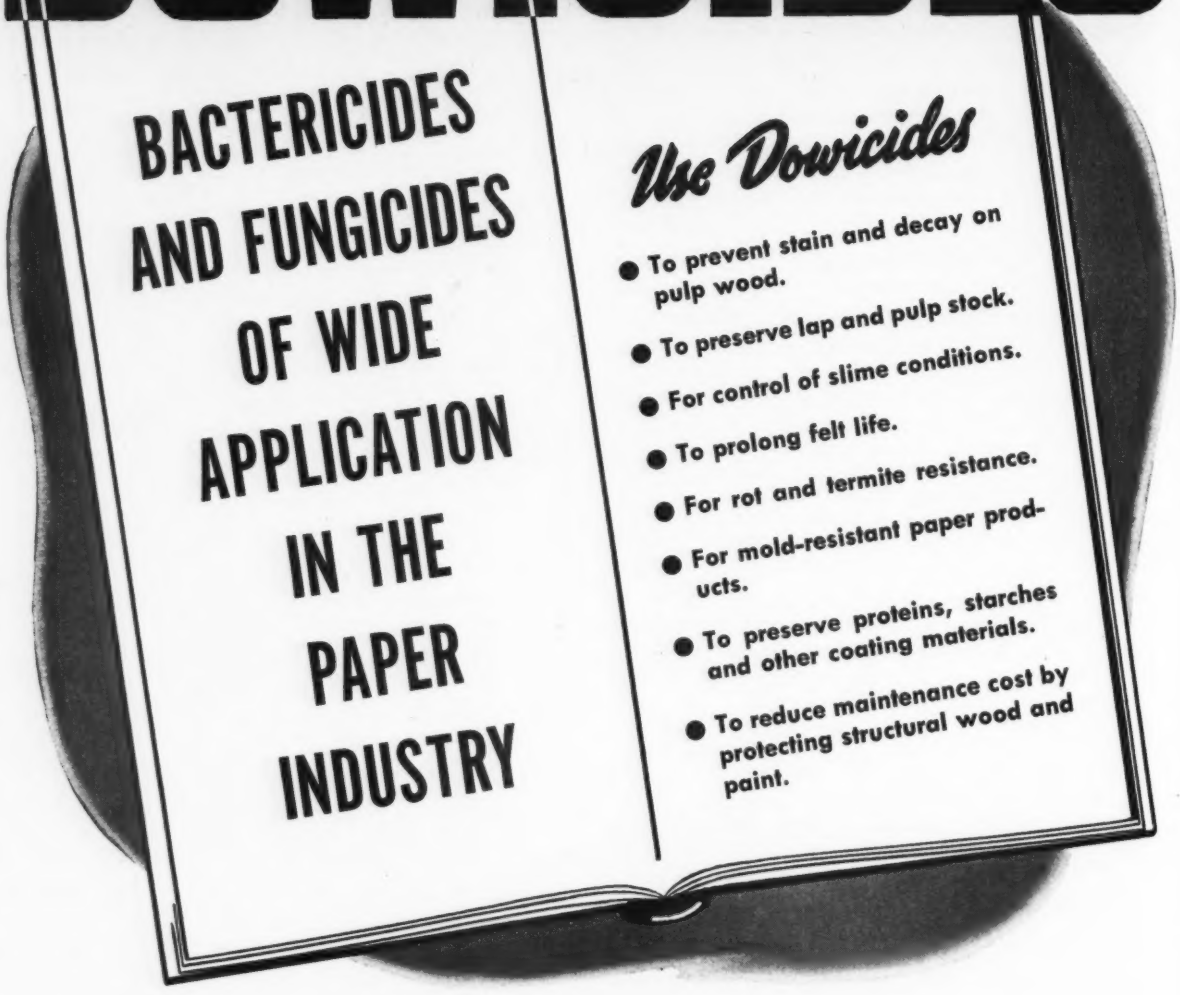
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Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Measuring Green Southern Yellow Pine Pulpwood by Weight or by Cord

By R. H. Miller[1]

The pulp industry has shown increasing interest in weighing pulpwood instead of measuring it by the cord. The industry is interested in any practical system of measurement that will give it a better measurement of the actual wood substance.

In order to determine the merits of both systems, Col. J. B. Cuno of the Forest Products Laboratory made an extensive study of the pulpwood delivered to a large pulp mill in Louisiana. Since it was not feasible to measure each bolt on a delivery truck in the field, Col. Cuno devised a unique photographic method of obtaining the desired information as to the actual wood content of more than 100 truck loads of pulpwood delivered to the mill. Measuring rods, one vertical and one horizontal, were included in the pictures. The pictures were subsequently projected on a screen so that the diameters of the bolts could be measured accurately without any correction factor. The measuring rods on the pictures were used as a check. From the projected pictures the percentage of summerwood, number of rings, and the percentage of heartwood were also determined.

Before the final results of all the 100 truck loads could be analyzed, Col. Cuno was called into active military service. Subsequently the analysis of the data has been completed by other members of the Forest Products Laboratory, and is presented here for the benefit of pulp mill operators who may be seriously considering the merits of weighing pulpwood instead of measuring it by the cord.

Means of Measuring

One of the advantages of measuring pulpwood by the cord is, of course, that it can be ricked up and measured in the woods and therefore is a satisfactory basis for paying the cutters on a piece work system. The principal objection to measuring by the cord is that the volume of solid wood in a cord varies with the diameter of the bolt and also with the lack of uniformity in piling. Moreover, the cutters and the truckers try to produce as loose a pile as possible and yet escape being penalized by the scaler at the mill. This, of course, leads to dissatisfaction. The method of measurement also has a bearing on the utilization of the rough and smaller sized wood, such as is yielded by tops and woods waste in many cases.

If the pulpwood is weighed, the mills would not care how the bolts were piled and the trucker would be more interested in piling the load as compact as possible so that he would get a big pay load. There would also be less chance of argument about weight than there is under the system of measuring by cord.

Whether measuring by weight or by cord the mill operator is interested in receiving the greatest weight of wood substance and paying according to what he gets. In conducting the study here reported, each truck load of wood arriving at the mill was numbered the average height and length of load determined, and the net weight of wood recorded as weighed by the company. The side that was measured was also carefully photographed. A limited number of samples were taken to get the moisture content and weight of bark as an average for all the loads.

A space of 128 cubic feet was considered the equivalent of a standard cord. The length of the bolts delivered to the pulp mill averaged 5.3 feet, and therefore the end area of a cord was taken as 24.15 square feet, instead of the familiar 32 square feet of the standard 4 by 4 by 8-foot cord. The truckers were paid on a weight basis; 5800 pounds being used as the equivalent of a standard cord. Figures from the study show that a standard cord of green, unbarked pine averaged 5603 pounds.

Most of the pulpwood studied was loblolly pine, and the rest was slash and longleaf pine. The pulpwood was hauled in green and unbarked. The wood was practically all sap. The average diameter of all bolts was 5.3 inches, and ranged from 2 to 14 inches in diameter. The average weight of bark was 10.4% and ranged from 6.4 to 23.0%. The average moisture content was 54 per cent, and individual pieces ranged from 42 to 65% in moisture. Summerwood averaged 36% of the wood. The average number of annual rings per inch was 4.4.

The average diameter of the bolts for the different loads varied from 4.0 inches to 6.8 inches. The average volume of solid wood was 73.76 cubic feet per cord, and ranged from 59.5 to 86.9 cubic feet per cord. About 70% of the loads had from 69.1 to 78.4 cubic feet of wood per cord or about 70% of them would vary less than ±6.4% from the average value.

[1] Engineer, Forest Products Laboratory, Forest Service U. S. Department of Agriculture, maintained at Madison, Wis., in cooperation with the University of Wisconsin.

The average ton of green, unbarked pine pulpwood contained 26.33 cubic feet of solid wood, and varied from 22.5 to 30.0 cubic feet per ton. About 70% of the loads varied from 24.8 to 27.8 cubic feet of wood per ton or varied less than ±5.8% from the average. Comparing this variation with the 6.4% variation in solid volume obtained by cord measurement it appears in this instance that measurement by weight gives results closely paralleling measurement by cord.

In view of the fact that the wood was practically all sapwood, the range in moisture content in individual sticks would not be attributed to variations in percentage of heart wood. Unless the range and average moisture content are represented in nearly every load, this factor will be so varied as to overshadow other differences. Although the company records showed a remarkable uniformity in moisture content of chips from test to test over a period of several years the percentage of moisture may not have averaged itself out in the material studied. Therefore moisture remains as a possible determining factor that caused the changes in the weight and volume ratio. No satisfactory correlation could be obtained between solid wood per ton and the average size of bolt, or between solid wood per ton and the percentage of summerwood.

Mathematical Calculation of Quantity

The number of bolts per ton is influenced by the diameter of the bolts, percentage of moisture, percentage of summerwood, weight of bark, and the like. A good correlation was found between the amount of solid wood per ton, the average diameter, and the number of bolts per ton. This correlation is expressed by the following equation:

$$Y_T = -17.14 + 5.51D + 0.46\ N_T$$

Where Y_T is the cubic feet of solid wood in a ton of green wood, including bark; D is the average diameter of the bolts on the truck; and N_T is the number of bolts in a ton.

All three factors in the equation are relatively easy to get. About 70% of the actual values were within the range of ±1.1 cubic feet per ton from the value given by the equation. The equation is based on bolts 5.3 feet long. For other lengths the equation will remain the same except the coefficient of N_T will be modified. For example, for 4-foot bolts the coefficient will be 0.46 (4/5.3) or 0.35.

The amount of solid wood in a cord varies with the diameter of the bolt and how close the bolts are piled. The number of bolts will, therefore, be a good criterion of how well the bolts have been piled. It was found that there was a good correlation between solid volume of wood in a cord, the average diameter of the bolts, and the number of bolts in a cord. For green wood, the correlation for bolts with the bark on is expressed as follows:

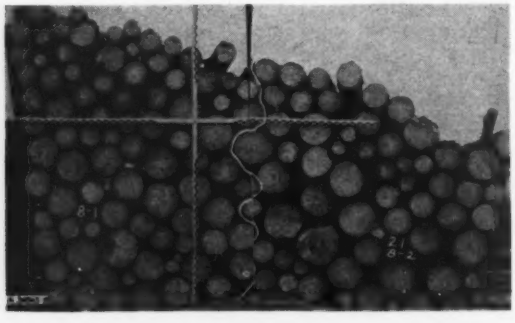

FIG. 1

Load of Large-Diameter Bolts. Average Diameter of Bolts 6.36 Inches; Actual Solid Wood Is 81.5 Cubic Feet per Cord and 29.0 Cubic Feet per Ton; Estimated Solid Wood Is 82.1 Cubic Feet per Cord and 28.6 Cubic Feet per Ton.

FIG. 2

Load of Small-Diameter Bolts. Average Diameter of Bolts 4.90 Inches; Actual Solid Wood is 70.0 Cubic Feet per Cord and 26.8 Cubic Feet per Ton; Estimated Solid Wood is 70.9 Cubic Feet per Cord and 26.6 Cubic Feet per Ton.

$$Y_c = -68.18 + 18.27\ D + 0.52\ N_c$$

Where Y_c is the cubic feet of solid wood in a cord of green, unbarked pine bolts; D is the average diameter of the bolts; and N_c is the number of bolts in a cord.

About 70% of the actual values were within a range of ±2.9 cubic feet of solid wood per cord of the value given by the equation. For other lengths the equation will remain the same except that the coefficient of N_c will be modified. For example, for 4-foot bolts the coefficient will be 0.39.

The average solid volume of wood in a ton is based on green, unbarked wood. The average weight of the bark was 10.4% of the total weight of the unbarked, green wood. If the wood is brought in green but peeled, the average solid volume of wood of 26.33 cubic feet of wood would have to be multiplied by the factor 1.116. This would also apply to the values given by the equation.

In estimating the solid volume of wood in a quantity of pulpwood, whether by weighing or by cord measurement, it will be noted that a marked improvement is obtained in making the corrections for average diameter and number of logs by use of the equations. For instance, when diameter and number were disregarded, the variation of solid volume per ton was about ±5.8% for about 70% of the loads, whereas when diameter and number was taken into account the estimated value comes within only about ±4.2% of the average. Similarly, in estimating the solid volume per cord the improvement was from ±6.4% to ±3.9% when correction for diameter and number is made by the use of the equation.

If closer estimates of individual loads are resired than can be obtained from the average value on a ton or cord basis, estimates can be made by an equation that recognizes the factors of average size of bolts and the number of bolts in the unit of measure. With such refined estimates, neither of the two systems of measurement has a marked superiority over the other in determining the actual amount of solid wood. If anything, on equal amounts of wood, the cord measurement would be slightly better.

The method of weighing is best when applied to wood that is received in the green condition, such as

prevails in southern pulp mills. Even in green wood, this study indicates that the moisture is quite variable. In northern mills the method of weighing would have to be supplemented with fairly accurate sampling for moisture determinations in order to account for the varying conditions in which the wood is received. The study indicates that the effect of variations in moisture in green wood on the solid volume of wood per ton can be overcome to a considerable extent if a correction is applied for the average diameter and number of logs. Similarly, in estimating the solid volume per cord corrections can be made for the variations in diameter and number of logs.

TAPPI Notes

George B. Hughey, formerly of the Ohio State University chemical engineering staff, is now in the research department of Merck & Co., Rahway, N. J.

Andrew Ryfun, formerly of the New York State College of Forestry, is now with the Champion Paper and Fibre Company, Hamilton, Ohio.

Joseph K. Post, formerly of the Valley Iron Works, is now with the American Viscose Company, Lewistown, Pa.

The title of the Pulp Purification Committee symposium to be held at the fall meeting of the Technical Association of the Pulp and Paper Industry at Ann Arbor, Mich., on September 16-19, 1941, is "The Determination of Oxidizable Materials in Pulp (Bleachability), Liquors and Wash Waters." This appeared in incorrect form in last week's issue of the PAPER TRADE JOURNAL and in TAPPI TOPICS.

A translation of Loeschbrandt's "Bleaching of Sulphate Pulp" will be issued as a separate printed publication by TAPPI, 122 East 42nd street, New York, N. Y. Copies will be sent to any member of the Technical Association on request. Non-members may purchase this volume at one dollar per copy. It is expected to be ready for distribution in August.

E. O. Ericsson, chief chemist of the Puget Sound Pulp and Timber Company, Bellingham, Wash., would like to obtain Vols. 1, 2, 3, 4, 6, 9, 11 and 12 of Technical Association Papers. Anyone wishing to sell any of these volumes is requested to write to Mr. Ericsson.

The Papermakers and Associates of Southern California will meet at the Mona Lisa Restaurant at 6:30 P. M., Thursday, August 7th.

The Massachusetts Institute of Technology, Cambridge, Mass., will give a two weeks' course in industrial statistics from September 8-20, 1941. This is for workers in industrial plants and laboratories interested in the analysis of experiments and the control of industrial output. Write to the Registrar, M.I.T.

OPM To Appoint Committee

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., July 16, 1941—Several meetings were held here last week in executive session in connection with the appointment of a new advisory committee for the paper industry with the OPM. No information on the meetings was made public. It is understood that a further meeting will be held when an advisory OPM industry committee of from 12 to 16 persons will be appointed consisting of various representatives of the entire paper industry.

Positions for Industrial Specialists

Trained personnel in every branch of industry, science and business is being called to Government service in this time of emergency. Individuals who know industrial methods and processes from first-hand experience are needed to contribute their part toward the integration of the expanding defense program. The Civil Service Commission has just announced an examination for industrial specialist posi tions paying from $2,600 to $5,600 a year. The examination (Announcement No. 102) is open for one month only. Applications will not be accepted at the Commission's Washington office after August 7.

Industrial specialists may be called upon to perform any of three types of jobs. The first is that of liaison representative in developing and maintaining working relationships with manufacturers of materials or equipment vital to the defense program. Secondly, they may act as consultants on industrial materials, methods and processes, or they may examine and evaluate data secured from the reports of various industrial concerns. The third possible assignment is that of investigator and analyst in the field of industrial materials, which involves the collection of data on production techniques, uses, consumption, and market supplies of particular materials.

To qualify for these positions, experience is required that has given the applicant a thorough knowledge of production methods and processes in one or more manufacturing industries. This experience may have been in industrial management, planning, engineering, cost accounting, business analysis, or research Applicants may substitute resident study in an educational institution above high-school grade, up to a maximum of 4 years, for this general experience. For each of the positions, applicants must have had some experience in one (or in a combination of not more than three) of the following industries: Iron and steel; non-ferrous metals; machine tools; ordnance; aircraft, marine and automotive equipment; railroad repair shops; radio and other electrical equipment, supplies and apparatus; textiles; forest products; paper; printing and publishing; chemicals; plastics; products of petroleum and coal; rubber products; stone, clay and glass products; leather and its manufactures; and food and kindred products.

Applicants are rated on their education and experience and upon corroborative evidence. An oral examination may be given to determine further an applicant's qualifications for the positions. No written test will be given. Further information and application forms may be obtained at any first- or second-class post office or from the Civil Service Commission in Washington.

New Sulphide Outfit

The LaMotte Chemical Products Company announces a new outfit for accurately determining total sulphides, dissolved sulphides and hydrogen sulphide in sludge, air and gases. This outfit is known as the LaMotte-Pomeroy Sulphide Testing Set.

The methods employed in this outfit were developed by Dr. Richard Pomeroy and with his exclusive cooperation, the apparatus was developed in the LaMotte Research Laboratory. The outfit is complete in every detail, including sampling pipettes, test tubes, solutions, flocculating bottle and set of instructions in handy wooden carrying case.

Relation Between Chain Length Distribution Curve and Tenacity*

By H. Mark[1]

Abstract

This paper discusses: (a) the experimental methods to fractionate cellulose and its derivatives; (b) the appropriate ways to represent the results of fractionation experiments; and (c) some recent results and their connection with the mechanical properties of the material.

Two experimental methods are available: fractionated solution and fractionated precipitation. None of them can be applied on cellulose directly up to this time, but they are both useful to analyze nitrocellulose and cellulose acetate. A direct fractionation method for cellulose would be welcome.

The appropriate way to represent the results is the chain length diagram of the material; it occurs that practically all high-polymers can be represented by two general types of curves. The preliminary state of our present knowledge on the connection between chain length diagram and tenacity occurs to indicate that the low molecular constituents are definitely unbeneficial.

It is well known that practically all natural and synthetic linear high polymers consist of a more or less nonuniform mixture of molecules having different chain lengths, different internal structure of the chains, and sometimes even different end groups. If the molecules are not strictly linear (and it seems that this is often the case) one has even to consider a different amount of branching or crosslinking if one compares various molecules of the same sample. In making observations on osmotic behavior, diffusion, viscosity, melting point, sedimentation, etc., one always has to interpret the experimental results by introducing certain average values for size, shape, and chemical constitution of the elementary particles of the material. The number average M_n and the weight average M_w molecular weight and the corresponding polymerization degrees P_n and P_w are particularly useful and important. Although it is now possible to tie up these average values with the osmotic behavior and the intrinsic viscosity of the material, it is not yet possible to bring them into reasonable agreement with the most important properties of the material in a more concentrated state, or in a very diluted solution as the flowing properties of concentrated solutions and the mechanical properties—i.e., elastic modulus, time of relaxation, tenacity, elongation, etc. — of the high polymeric gel as such (fibers, films, etc.). It is an old problem to find out whether this latter connection is as unambiguous as the former, or in other words, whether changes in the distribution of the molecules, which do not (or only slightly) affect the above-mentioned average values, have a considerable and perhaps decisive influence on the behavior of the material in the concentrated state (as spinning solution, lacquer, filament, molding, etc.).

There exists a large amount of technical experience, which indicates that such simple average values as M_n, M_w, P_n, and P_w are entirely insufficient to predict in any reliable way the behavior in the concentrated state, but it is difficult to utilize these rather qualitative and widespread experimental facts to formulate a clear general statement as to the influence of the molecular inhomogeneity of a sample on its physical properties.

Principally there are two ways to approach this problem, an analytical and a synthetical one. The first starts with a material of well known physical properties as tenacity, elongation, solubility, opacity, dielectric constant, etc., tries to investigate its molecular heterogeneity and then faces the task of drawing reasonable conclusions as to their mutual relationship. The second (presumably the more flexible and promising one) starts to prepare fractions of as high uniformity as possible, to synthesize by suitable mixing and blending samples of characteristic types of heterogeneity and investigates their final properties.

It can be seen that three experimental tasks have to be dealt with: (a) the analytical determination of the inhomogeneity; (b) the preparation of pure fractions; and (c) the suitable selection and quantitative determination of the physical properties to be investigated.

The last problem offers comparatively little difficulty. Frequently it happens that a certain property outstands all others in importance and will therefore be chosen as the main object of investigation. It must be emphasized however that we know little at present about which special characteristic of a solid high polymer (tenacity, elongation, brittleness, etc.) reacts most sensitively to a change of the molecular distribution at constant average value. It may be that one often selects properties, which, although being of special technical importance, are not suitable as a means for distinguishing samples of different uniformity.

Both (a) and (b) are delicate problems and each single method, which has been used hitherto presents certain difficulties and uncertainties. From the analytical point of view the ultracentrifuge presumably offers the best chance for a reliable insight into the heterogeneity of a given material, but it is strictly confined to the analysis and the realm of large, chain-like molecules requires quite considerable experimental efforts. It has been repeatedly applied with great care. A series of papers by Stamm *(42)*, Kraemer and Lansing *(21)*, Signer and Gross *(41)* and particularly by Kraemer *(19)* contribute important experimental material for the quantitative description of the heterogeneity of certain high polymers.

However, considering the fact that the ultracentrifuge is an expensive instrument, it seems that in future the preparation of fractions by means of

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Roosevelt Hotel, New York, N. Y., Feb. 17-20, 1941.

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selective solution or precipitation is going to play the leading role in the further investigation of our problem.

It may therefore be appropriate (a) to describe in more detail the technique of the preparation of fractions of improved uniformity, and (b) to report our present knowledge of the connection between molecular heterogeneity and physical properties.

Methodical Remarks

Some of the more recent papers dealing with the problem of splitting a given material into a series of fractions by means of their different solubility at given experimental conditions are cited. Two simple fundamental facts are the starting points:

(1) If one digests a high polymer—e.g. nitrocellulose—with a suitable liquid, which may be a pure substance or a mixture of several of them, one observes that only a part of the material goes in solution. The rest remains as a swollen gel. The average values M_n and M_w for the dissolved fraction are different (smaller) than those for the undissolved material.

(2) If one dissolves a high polymer in a solvent, preparing a highly diluted solution (2% of weight or less) and then adds a nonsolvent, one observes that a part of the material precipitates as a swollen gel, while the rest remains dispersed in a homogeneous solution. The average values M_n and M_w for the precipitated fraction are different (larger) than those for the dissolved material.

Since the first observations of these facts, a long series of important papers *(2, 3, 4, 8, 9, 12, 17, 18, 23, 27, 31, 33, 34, 37, 38, 45, 46)* have contributed to the present state of our knowledge. Both ways have developed simultaneously and obviously it would be unreasonable to consider them as being competitive methods. On the contrary they complement each other. In some cases the fractionated solution may be superior, in others the fractionated precipitation. But it may be not superfluous to check how both methods agree if the same material is subjected to them. Such an experiment has been carried out with nitrocellulose, with the result that the agreement was fairly satisfactory (*see* Table I and its discussion) if one considers that the whole characterization of M_n and M_w is of rather limited accuracy. However, it would be desirable to have this agreement tested in more than one single case.

In order to describe and communicate the results of a fractionation experiment (precipitation or solution) it is best to use the ternary phase diagram *(1, 3, 28, 30, 43)* as shown in Fig. 1 which gives the result of the fractionation of a polystyrene sample prepared at 125 deg. C. in the pure liquid phase with benzoyl peroxide as catalyst.

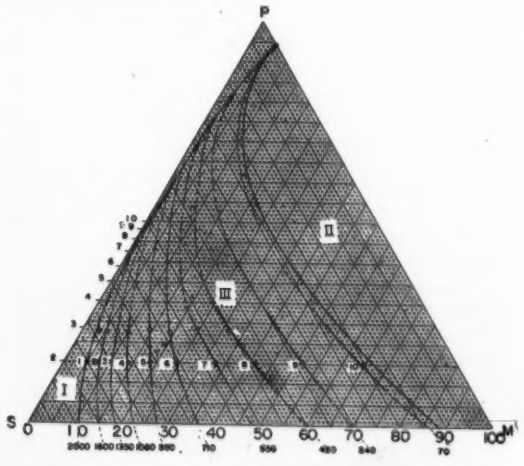

FIG. 1

Ternary Diagram Describing the Fractionated Precipitation of a Polystyrene Sample

TABLE I.—FRACTIONATION OF A CELLULOSE NITRATE
(10 g. with an average P_w = 960 gave)

Fractionated Precipitation		Fractionated Solution	
g.	P_w about	g.	P_w about
0.4	2000	0.5	120
1.1	1450	1.4	320
3.4	1250	2.1	710
3.1	800	3.7	1010
1.1	350	1.5	1320
0.3	90	0.6	1800
Total 9.4 g. with P_w = 1010		Total 9.6 g. with P_w = 870	

The point P represents the pure polystyrene, the point S the pure solvent (in this case methyl ethyl ketone) and the third point M the pure precipitant (in this case methanol). Along the line PS one has in the upper part a swollen gel (polystyrene swollen in methyl ethyl ketone), in the lower part a homogeneous solution (polystyrene dissolved in methyl ethyl ketone). Along the line SM one has complete miscibility between methyl ethyl ketone and methanol —i.e., a homogeneous solution of M in S (at least at the temperature for which the diagram holds). Along the line MP one has a gel (polystyrene swollen in methanol) and a supernatant liquid (methanol).

We start our experiment with a 2% solution of the given high polymer (it may be a cellulose derivative as well as polystyrene, polyisobutylene, or rubber), which is a homogeneous solution (1-phase system) and at constant temperature add methanol slowly. After a certain concentration of M is reached a fraction appears in the form of a fluffy, white precipitate; the system splits into 2 phases: a homogeneous solution and a swollen gel. If one separates this fraction by suitable filtration and determines M_w one finds P_w around 2000, while P_w of the total sample was around 950. Adding more methanol one gets another fraction of P_w around 1600 and so on. In this way one reaches the point 10 in Fig. 1 at which further addition of methanol does not cause any further precipitation, although there is still some polymer (about 1.5% of the original amount) in the solution. This means that the low polymeric material, which is still dissolved, is even soluble in pure methanol.

Diagrams of the type of Fig. 1 reflect in a fair way the results of a fractionation. Obviously one has three different areas:

I. The homogeneous solution of the heterogeneous polymer in a liquid of low M-content (1-phase system)
II. The homogeneous solution of low polymeric material (lowest fraction) in a liquid of high M-content (1-phase system)
III. The coexistence of a swollen gel (higher fraction) and a homogeneous solution, (lower fraction) in liquids of medium M-content (2-phase systems).

As the points 1, 2, 3, etc., are further apart, respectively from each other along the fractionation line of constant (or nearly constant) polymer concentration, the higher is the resolving power of the chosen system P S M in respect to fractionation. It has been found by Spurlin *(44)*, Schulz *(43)* and others *(30)* that the appropriate choice of S and M is of great importance for obtaining homogeneous and easily filterable precipitates. Figure 1 shows further that the resolving power increases markedly with decreased concentration. Sometimes it is possibly by adequate choice of S, M, and temperature (or by adding a fourth component to the system) to obtain 2 liquid phases instead of one solution and one swollen gel. In such cases the separation of the fractions is particularly simple, and it seems that good resolving power can be reached. It may be that this is due to the fact that upon shaking of the 2 coexistent solutions, solubility equilibrium is more closely

approached than if a gel and a solution are in touch with each other.

Finally it may be pointed out that recent experiments with polystyrene *(30)* show the best resolving power is obtained if one works at a given concentration of *M* in *S* and fractionates by slowly dropping the temperature, instead of keeping temperature constant and changing the ratio *S* to *M*. A more detailed description of this method would exceed the limits of this article and will therefore be given elsewhere. It seems that it can be applied successfully to polystyrene as well as to rubber, polyisobutylene, polyvinyl and polyacryl derivatives, cellulose esters, and ethers *(3, 11, 15, 43, 47)*.

The following results concerning the heterogeneity of cellulose samples of different provenience all have been obtained by fractionation of the nitrated material *(9, 39, 40, 48)* from a solution in butylacetate or acetone, using heptane according to Spurlin *(44)* and decreasing the temperature as described above. In all cases of fractionation by precipitation one runs through the fractionation line 1-10 from left to right, obtaining the highest fraction first and the lowest remains in solution.

The results obtained in this way will be compared with experiments carried out by a fractionated solution, using mixtures of alcohol and acetic ester of different concentrations at constant temperature. These recent studies of Schieber and his coworkers *(9, 39, 40)* have contributed essentially to the problem to which this paper is devoted. In the case of fractionation by gradual solution one runs through the fractionation line from 10 to 1, getting the lowest fraction first, while the highest remains as swollen gel after the extraction of all the others.

In order to be sure that a comparison of the two methods is legitimate one and the same sample was subjected to both methods. The results are shown in Table I and the agreement can be called a sufficient one.

The next question is how one best represents graphically or by a suitable algebraic expression the results of a fractionation. The immediate outcome of any fractionation experiment is always a table of the type of Table I. The simplest way of presentation is to convert this table directly in a curve plotting the weight of the fractionated or dissolved material against its polymerization degree. This leads to a step curve. Figure 2 shows the step Curve 1 corresponding to the fractionation experiment of Table I.

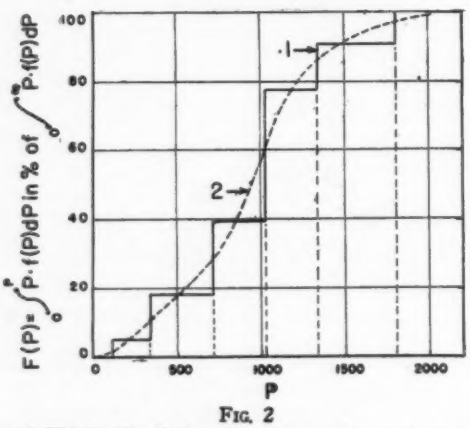

FIG. 2

Integral Weight Distribution Curve F(P) Corresponding to the Experiment of Table I

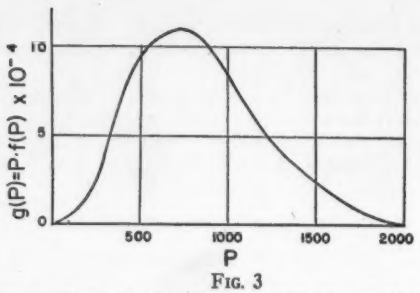

FIG. 3

Differential Weight Distribution Curve g(P) Corresponding to Fig. 2

It can be converted into a smooth curve by interpolation (Curve 2).

If $f(P)dP$ denotes the number of all molecules having a polymerization degree between P and P plus dP, then $Pf(P)dP$ measures the total amount (by weight) of the material which is present in this degree of polymerization. Hence the smooth curve of Fig. 2 represents

$$F(P) = \int_0^P Pf(P)dP \qquad (1)$$

It has been called the integral distribution curve and has been discussed particularly by Flory *(15)*, Kraemer *(19, 20)*, Schulz *(43)*, and Spurlin *(44)*. In order to get the weight distribution function

$$g(P) = Pf(P) \qquad (2)$$

one has to differentiate the smooth curve of Fig. 2 point by point (graphically) and to plot the result against P. The outcome of this procedure is shown in Fig. 3. If one wants the number distribution function $f(P)$ one has still to divide by P.

In the following paragraphs all results will be represented by weight distribution curves (chain length diagrams), which have been obtained in the way described.

Whether or not such curves can be worked out with good accuracy depends mainly upon the chemical character of the investigated system. Polyhydrocarbons—e.g., rubber, polyisobutylene, polystyrene—are comparatively easily treatable, especially by fractionated precipitation *(3, 30, 41, 43, 47)*. Linear synthetic poly esters, vinyl esters, cellulose esters, and ethers have been split with success, although sometimes the fractionation is relatively ineffective and laborious *(15)*. Little is known about fractionation of acrylic derivatives, polyvinylchloride, and vinyl copolymers. Cellulose as such can only be fractionated if the average polymerization degree is relatively low and even then the solubility curves in NaOH, $CuO\text{-}NH_3$ and quarternary ammonium bases are so steep that the resolving power remains rather low. Solubility in NaOH at different temperatures, in $CuO\text{-}NH_3$ or triton at different concentrations *(1, 24, 28)* gives certain information on the form of the distribution function at lower chain length, but does not really allow completion of the $g(P)$ curve. The nitration method leads to reasonable $g(P)$ curves, but is only of analytical importance, because one cannot denitrate the fractions and re-use them for synthetic purposes without considerable and uncontrollable degradation. It would certainly be of great importance to have a reliable direct fractionation for cellulose in the range of higher polymerization degrees.

Some Recent Results

There are two sources for high polymeric substances available: (a) synthetic polycondensation and

polymerization products, and (b) purified—i.e., in most cases more or less degraded—natural high molecular substances.

Our present experimental knowledge seems to indicate the following situation:

(a) All synthetic high polymers (condensation and polymerization products), whose size and structure is determined by polycondensation or by the superposition of a propagation (rate k_p) a termination, (rate k_t) and a branching reaction, (average number of branches per molecule = b) are fairly well described by a weight distribution function

$$g(P) = a^P, (1 - A)^{b+2}, \frac{P^{b+1}}{(b+1)} \qquad (3)$$

a is determined by the ratio of k_p and k_t according to

$$a = 1 - \frac{k_t}{k_p} \qquad (4)$$

This equation can be derived by a statistical consideration *(30, 43)* which is an extension of the one being used by Flory *(15)* and Schulz *(43)* in their papers on polycondensation and polymerization.

Distribution functions of this type have the general shape as shown in Fig. 4; the position and sharpness of the maximum depends on both parameters a and b, the curves fall off sharply towards the low molecular end, while they flatten out on the high molecular side.

The experimental results up to this date, which are mainly to be credited to Flory *(15)* and Schulz *(43)*, indicate that Equation 3 represents fairly well the known facts.

(b) If one prepares a high molecular sample by degradation of a linear natural polymer (rubber, cellulose, etc.) using a homogeneous degradation reaction and a completely uniform starting material, one gets according to Montroll, Simha, Durfee and Kertesz *(13, 32,)* weight distribution functions of the following type

$$g(P) = a^P(1 - a)[2 + (P_0 - P)(1 - a)]. \frac{P}{P_0} \qquad (5)$$

In this equation P_0 is the polymerization degree of the original sample (assumed to be absolutely homogeneous) and a is connected with the ratio of the number of broken bonds n_b to the number of the original bonds n_0 by

$$a = 1 - \frac{n_b}{n_0} \qquad (6)$$

This relation corresponds closely to Equation 4.

Distribution functions of the type in Equation 5 show different typical forms for high and low degrees of degradation. In the former case they approach the shape as shown in Fig. 4 and according to Kuhn *(16, 22)* assume the form of Equation 3 for b = 0. In the latter case, however, they have the same general shape as Curve 2, Fig. 5 where the gradual cleavage of a high polymer with $P_0 = 1500$ is represented *(29)*. One sees that slight homogeneous degradation of uniform high molecular weight substances leads to distribution functions which are steep on the high and flat on the low molecular side.

It seems that there is experimental support for this fact and hence for the validity of Equation 5 *(13, 30, 32)*. However, it must be pointed out that both conditions for this relation, namely, homogeneity of the degradation reaction and uniformity of the original sample are never strictly fulfilled. It seems that under special conditions (aging of alkali cellulose, milling of rubber, degrading of cellulose acetate) more homogeneous distribution functions than those predicted by Equation 5 can be obtained. Examples are shown in Fig. 9 and 10 and have been discussed by Kraemer *(19, 20, 21)*, Ott *(37)*, and Schulz *(43)*. Presumably such materials are produced if either the heterogeneity of the system favors the opening of special (most exposed) bonds, or if the degradation process is accompanied by some kind of fractionation or washing (taking away very highly degraded fractions, etc.). Such samples of higher uniformity are best described by a Gaussian distribution function *(37, 43)*.

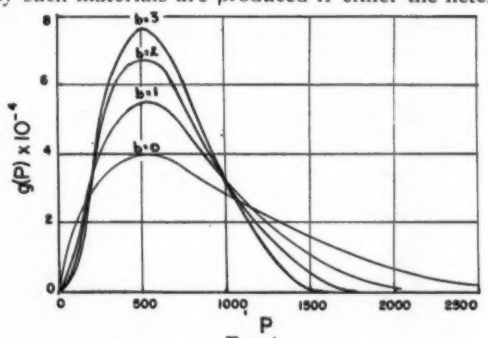

FIG. 4

Some Differential Weight Distribution Curves (Chain Length Diagrams) for Polymerization Products with Different Degrees of Branching (b-0 to b-3)

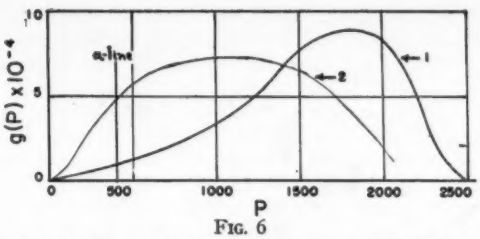

FIG. 6

Chain Length Diagrams of Cotton Linters (1) and Wood Pulp (2)

These general remarks on the present capability of a mathematical description of high polymers may be followed by some experimental data on cellulose samples.

Figure 6 (Curve 1) shows the distribution curve of commercial cotton linters as used in the rayon industry. It can be seen that the function has the general shape of Curve 2 in Fig. 5, which would characterize the material as a mildly degraded product. Such cotton linters samples have an α-cellulose content of about 97-98%.

It may therefore be allowed to divide the area below the curve into two parts: one of 2.5% at the low end (comprising β- and γ-cellulose) and one of 97.5% (representing the α-cellulose). If one does this, one finds that the α-cellulose border cuts through the curve at a polymerization degree around 400. Everything below being β- or γ-cellulose, everything above α (as defined by the standard α-test).

Figure 6 (Curve 2) gives the distribution function of commercial wood pulp as used in the rayon industry. Placing the α-border again at $P = 400$ one arrives to an α content of 90-91% which is in agreement with the expectation. This curve shows the shape corresponding to a slightly higher degraded linear polymer, approaching the symmetrical type which lies between Curves 2 and 3 of Fig. 5.

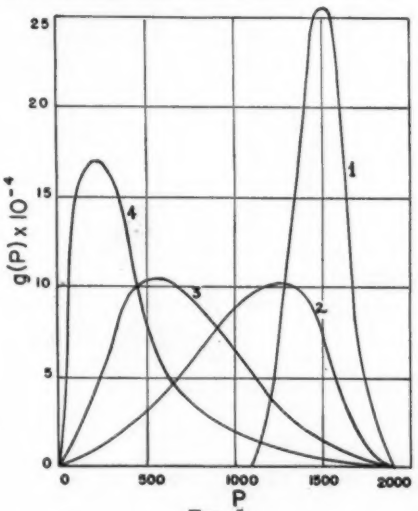

FIG. 5

Chain Length Diagrams for Homogeneously Degraded Samples. Curve 1: Starting Material with $P_0 = 1500$. Curve 2: Slight Degradation to $P = 1150$. Curve 3: Moderate Degradation to $P = 600$. Curve 4: High Degradation to $P = 250$

The two curves have been worked out using the nitration method of Berl *(2)* and Schieber *(9, 39)*, but carrying out the fractionation by precipitation as introduced by Spurlin *(44)*.

Schieber has recently published *(39)* several interesting chain length diagrams of similar samples. He presents his results as integral weight distribution curves. In order to have a better comparison some of these curves have been converted into *g(P)* functions and are given in Fig. 7. They have been obtained by fractionated solution of the nitrated product. It is surprising how fairly their general shape agrees with Figs. 6 and 7. This can perhaps be taken as an indication that such chain length diagrams really reflect an intrinsic property of the system and would lend themselves to a quantitative study of the different steps of degradation and purification which are carried out with such materials.

Schieber *(40)* has undertaken the first systematic investigation along these lines. Figure 8 shows diagrams of a normal rayon pulp (Curve 1), an alkali cellulose aged by the normal procedure (Curve 3), and an alkali cellulose aged continuously (Curve 2).

First of all it can be seen that the two differently degraded Samples 2 and 3 show distinctly different diagrams, although the degree of cleavage (aging time under given conditions) is approximately the same. Obviously Equation 5, based upon the assumption of a homogeneous degradation, is incapable of covering this effect and the theory has to be improved in this direction.

In order to get more experimental material two series of degradation experiments have been carried out.

(1) One under as homogeneous conditions as possible (hydrolyzing cellulose acetate in acetic acid solution).
(2) One in a distinctly heterogeneous system (degradation of wet alkali cellulose by oxygen).

The results of the first study have been communicated *(29)* earlier; it seems that they fit not too badly into the prediction of Equation 5.

The results of the alkali cellulose oxydation are given in Fig. 9. Curve 1 gives the initial material, Curves 2 and 3 show degraded samples after 24 and 72 hours aging. Comparison with Schieber's results (Fig. 8) shows that his earlier experiments are essentially confirmed, although our results are between his normally and continuously aged samples.

At present (with a rather limited experimental evidence) all one may conclude, seems to be the following: oxidation degradation in a heterogeneous systems leads to sharper diagrams as predicted by Equation 5, and the shape of the distribution curve is extremely sensitive to such experimental conditions as temperature, density, oxygen concentration, etc.

It would perhaps be premature to draw any kind of far reaching conclusions from the present (rather preliminary) state of experimental knowledge on the chain length diagram of degraded cellulose samples

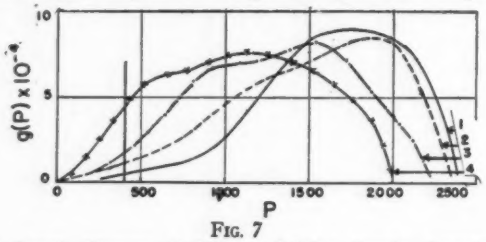

FIG. 7

Chain Length Diagrams of Different Cellulose Samples According to W. Schieber. 1 = Cotton Linters. 2 = Sulphate Pulp (Spruce). 3 = Sulphite Pulp (Spruce). 4 = Sulphite Pulp (Beech)

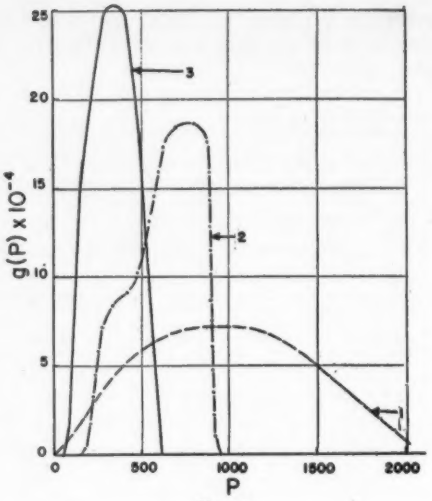

FIG. 8

Chain Length Diagrams of Differently Degraded Cellulose According to W. Schieber. 1 = Original Cellulose. 2 = Aged Continuously. 3 = Aged Normally

and it may be timely to pass to the last problem, namely the connection of the distribution curve with the physical properties of the material.

Chain Length Diagram and Physical Properties

Carothers *(5, 6)* was one of the first *(11, 35)* to establish a connection between the average chain length of a high polymer and its tenacity, showing that a critical minimum polymerization degree of around 50 is necessary in order to produce films or filaments at all. Later the tenacity increases roughly proportional to the chain length and starts to get only slightly dependent upon *P*, as soon as the polymerization degree exceeds 300. The exact shape of this average chain length-tenacity curve depends distinctly upon the chemical character of the system and upon the conditions at which the sample was prepared (spinning, casting, stretching, etc.). Several papers have dealt with this problem. Polyesters, polyamides, polyvinyl-derivatives, rubber, nitrocellulose, and cellulose acetate have been investigated.

Much less is known about the connection between the chain length diagram and the physical properties. Ohl *(35)* first pointed out that cellulose acetates having the same average chain length but different dis-

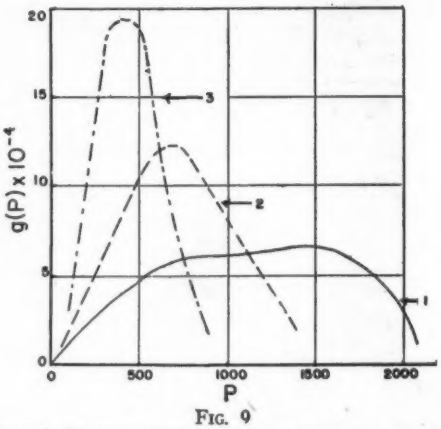

FIG. 9

Chain Length Diagrams of Three Cellulose Samples: 1 = Original Cellulose. 2 = After 24 Hours Aging. 3 = After 72 Hours Aging

tribution curves seem to exhibit different tenacity properties, but his evidence was only an informative one.

Spurlin *(44)* was the first to carefully prepare a series of fractions of nitrocellulose, cast films, and determine the tenacity and folding endurance of them. He did not find any significant influence of the chain length diagram on the stress-strain curve under his experimental conditions, but there was a certain superiority of the fractionated samples in the fold test as compared with blends. Mixtures which contained a comparatively large amount of low molecular weight material proved to be decidedly inferior.

An advanced study of the influence of the chain length diagram on the properties of viscose staple fibers was recently reported by Schieber *(9, 39, 40)* who investigated eleven staple fibers, and reached the general conclusion that the outstanding point is the detrimental influence of moderate amounts (5 to 15%) of chains below a certain critical polymerization degree (for viscose staple fiber around 70 to 100). The distribution curves were worked out by nitration of the fibers and fractionation of the nitrate by selective solubility in acetic ester-alcohol mixtures. This method obviously gives interesting chain length diagrams of great analytical importance, but does not permit one to prepare synthetic distribution curves of distinct shape, converting them into filaments, and study their properties. Some experiments which provide a certain amount of data in this direction were started in 1935 with cellulose acetate *(29)*.

A commercial cellulose acetate of an acetyl content of 39.3% and a weight average polymerization degree of 265 was split in 7 fractions as shown in Table II. All polymerization degrees were measured in acetone at 20 deg. C. using 10^{-3} basal molar solutions. Blends were made with these fractions according to Table III in such a way that their specific viscosity approached closely the one of the original sample ($\eta_{sp} = 0.065$).

Some of these blends were spun in laboratory dry spinning equipment using 22.5% solutions of acetate in 96% acetone and circulating hot air and after conditioning their tenacities were determined. The filaments had between 2.2 and 2.6 deniers.

The results are given in Fig. 10. The parallel range *KLMN* represents the tenacities obtained with 20 samples of the original material; they range between 175 and 181 grams per 100 denier. They may be considered as characteristic for the chain length diagram of the original sample (Table II). The distance of the two crosses along the line *AG* shows the range

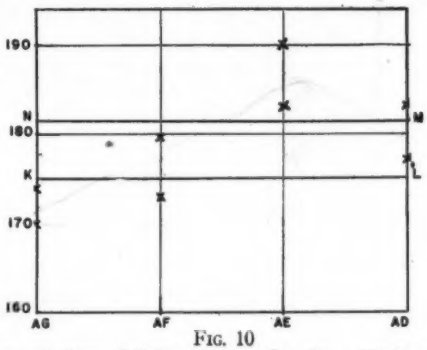

FIG. 10

Tenacities of Some Cellulose Acetate Samples. Abscissae . . . Sample as Indicated in Table III. Ordinate . . . Tenacity in g Per 100 Deniers.

inside of which 8 samples of the first blend of Table III were situated. This is a material with 35% short chains and is decidedly on the weak side. Blend *AF* and *AD* are close to the starting material, while blend *AE* is slightly on the high side.

In order to estimate the significance of these results it must be pointed out that the spinning setup was much too small and crude to obtain anything like stationary spinning conditions, that each sample consisted of only a few grams and that only 8 or 10 single Schopper curves were taken.

TABLE II.—CELLULOSE ACETATE FRACTIONS

Sample	PD	Mol. wt.	η_{sp} in 10^{-3} basal molar sol.
A	400	110,000	0.096
B	340	90,000	82
C	270	70,000	65
D	160	43,000	39
E	100	27,000	24
F	50	13,500	12
G	30	8,000	07

TABLE III.—MIXTURES OF FRACTIONS

%		%		η_{sp} (calc.)	η_{sp} (obs.)
			A + X		
65	A +	35	G	0.0649	0.061
63	A +	37	F	0.0649	0.066
57	A +	43	E	0.0653	0.061
46	A +	54	D	0.0661	0.068
			B + X		
78	B +	22	G	0.0655	0.069
76	B +	24	F	0.0639	0.060
71	B +	29	E	0.0650	0.062
61	B +	39	D	0.0654	0.067

It seems therefore that one can only consider these measurements as being an indication that under the given conditions a certain influence of the chain length diagram on the tenacity was detectable and that this influence keeps along the same lines as the observations of Spurlin *(44)* and Schieber *(40)*.

New experiments with larger quantities of more carefully fractionated and reblended samples will be needed to give a more reliable answer to the question of the relation between chain length diagram and physical properties of high polymeric samples.

Acknowledgment

The experiments described above were started in 1935 in Vienna, Austria and finished in Brooklyn, N. Y. The author wishes to express his sincerest thanks to his collaborators, particularly to A. Bartovics, E. Broda, H. Phillipp, and R. Raff. From 1938 to 1940 the author had the privilege to belong to the staff of the Canadian International Paper Company in Hawkesbury, Ontario, Canada. He feels much indebted to S. Wang, Manager of Laboratories, for many interesting, inspiring, and critical discussions of the involved problems from the fundamental to the technical end. Any considerations or conclusions along commercial or industrial lines have of course been excluded from the above paper.

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Staybelite—A Hydrogenated Rosin for Size*

By A. C. Dreshfield[1] and J. H. Long[2]

Abstract

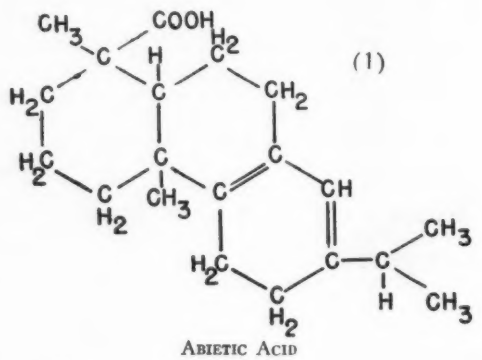
The tendency in rosin and rosin size to oxidization is accompanied by discoloration and other undesirable tendencies. By a catalytic process carried out at high temperature and high pressure, a nonoxidizing and nondiscoloring resin has been produced for sizing purposes.

Technological progress in the paper industry has been paralleled by similar progress in those industries which serve it. This is especially true in the field of papermaking chemicals where for more than a quarter of a century research efforts have been directed toward the production of better rosin sizes and their more efficient use. An all-important step in the production of better rosin size was realized when it became possible to exercise control over both the quality and the uniformity of the rosin from which sizes are made. It was logical for the wood naval stores industry to make valuable contributions toward the achievement of this control because the manufacture of rosin by solvent extraction followed by refining is a controlled chemical process.

In general, improvement in wood rosin quality has been directed principally towards the separation of more desirable from less desirable components. While it is possible to refine rosin to some different but definite composition, the product consisting of 91% resin acids and 9% neutral bodies is adequate for most industrial needs.

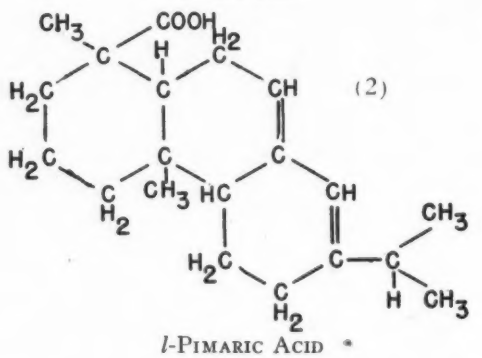
The resin acids are principally abietic acid and its isomers, l-pimaric acid, sapinic acid, and small quantities of d-pimaric acid. Traces of oxidized resin acids, depending on rosin grade, are also present. The structural formula of two of the more important isomeric resin acids are shown in Formulas 1 and 2.

In addition to the chemically reactive carboxyl group, the resin acids contain two carbon to carbon double bonds or ethylenic linkages. It is a characteristic of many unsaturated molecules having ethylenic double bonds to combine with oxygen. In



(1)

ABIETIC ACID



(2)

l-PIMARIC ACID

TABLE I.—REFINED WOOD ROSIN COMPOSITION

91% Resin Acids		9% Neutral Bodies	
Abietic acid	40%	Steam-volatile material.	0.3%
d-Pimaric acid	10-15%	Esters, hydrocarbons, etc.	8.7%
Noncrystalline isomeric acids	41-36%		

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Roosevelt Hotel, New York, N. Y., Feb. 17-20, 1941.

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[2] Hercules Powder Co., Wilmington, Del.

the case of the rosin acids, this property is displayed to a marked degree. Compared to rosin, pure abietic acid obtained by careful separation from rosin will react even more rapidly with oxygen from the air. From a more practical standpoint, however, the oxidation of the double bonds of rosin is accompanied by the formation of color bodies and changes in solubility and compatibility characteristics. Therefore, for some purposes any further improvement in rosin quality by more complete separation of the nonacid portion must be looked upon merely as a temporary expedient. For many uses, a more permanent improvement is desired.

Fortunately, high molecular weight molecules whose double bonds are highly reactive to oxygen are reactive to hydrogen. In contrast to oxidation, hydrogenation generally destroys color bodies and usually makes their subsequent formation more difficult. Preliminary laboratory experiments demonstrated that abietic acid was no exception to this rule. In contrast to abietic acid which reacts readily with oxygen, hydrogenated abietic acid was found to be relatively inert to oxygen pick-up. As was expected, the hydrogenation reaction did not interfere with the reactivity of the carboxyl group, and it did not result in any significant change in such characteristics as solubility and compatibility.

The hydrogenation of abietic acid apparently takes place in two stages. The formation of dihydroabietic acid from hydrogen and abietic acid is a relatively fast reaction, while the subsequent hydrogenation of the dihydroabietic acid to tetrahydroabietic acid is a relatively slow reaction. These same observations hold true for rosin.

The first experiments on pure abietic acid were the basis for further work which has led to the commercial production of hydrogenated rosin[3]. The prejudice that it would be technically and economically impossible to hydrogenate rosin has been overcome. Many years of patient and persistent effort have gone into this accomplishment, which must be ranked as another chemical engineering triumph.

Staybelite is produced by reacting rosin and hydrogen at high temperature and high pressure in the presence of a catalyst. Since the process involves the handling of large volumes of materials, it would be commercially impracticable if carried out in autoclaves as a batch process. It was necessary to develop a continuous reaction process which involves feeding hydrogen and rosin into reaction towers containing a stationary catalyst and removing the reaction products at a constant rate. Needless to say, proper design of equipment was a major problem, not only because of the high temperatures and high pressures necessary for reaction but because of the acid nature of rosin. Likewise, the catalyst had to be of a highly active and physically rugged type so that it would continue to promote reaction, yet resist the physical and chemical action of the molten rosin. Furthermore, the catalyst had to have the specific property of accelerating the rate of hydrogen addition to the rosin double bonds without promoting reduction of the –COOH group to a $-CH_2OH$ group. As a further consideration, the process had to be carried out under such conditions that decarboxylation of the resin acids to resenes was prevented.

Many of the successful industrial applications of rosin are based on such important characteristics as melting point, acid number, saponification number, unsaponifiable content, and solubility. Comparative data on these properties for hydrogenated rosin and various grades of wood rosin are given in Table II which shows that this new product conforms to specifications involving these properties.

The reactions to the new product that depend on the carboxyl group are not affected by hydrogenation. It can be esterified with monohydric alcohols, dihydric alcohols, and trihydric alcohols to give products which differ principally from the corresponding rosin derivatives in that they are highly resistant to oxidation and discoloration.

Hydrogenated rosin can be reacted with alkali such as sodium hydroxide or potassium hydroxide to give the corresponding sodium and potassium soaps. In order to retain the color advantage throughout the soap making cycle, it was necessary to develop a new technique involving both equipment and processing.

[3] Available under the trade name Staybelite. (Reg. U.S. Patent Office).

TABLE II.—COMPARISON PROPERTIES STAYBELITE *VS.* WOOD ROSINS

	Staybelite	N Wood Rosin	I Wood Rosin
Acid number	162	167	163
Melting point (drop method), ° F.	167	181	179
Saponification number	167	172	170
Unsaponifiable matter, %	8.9	6	7.5
Specific rotation, deg.	+26	+12	+12.0
Petroleum ether insoluble, %	0.1	0.1	0.2
Gasoline insoluble, %	0.015	0.015	0.018

TABLE III.—SOLUBILITIES AND COMPATIBILITIES

Natural Resins	Remarks
1. Kauri	Miscible in all proportions
2. Congo copal (run)	Miscible in all proportions
Oils and Plasticizers	
1. Castor oil	Soluble
2. Linseed fatty acids	Soluble
3. Dibutyl phthalate	Soluble
4. Tricresyl phosphate	Soluble
Solvents	
1. Varsol	Above 40% concentration crystallizes
2. Toluene	Above 60% concentration crystallizes
3. Turpentine	Above 40% concentration crystallizes
4. Alcohol	Above 40% concentration crystallizes
5. Butyl acetate	Above 40% concentration crystallizes
6. Cresols	Above 20% concentration crystallizes
7. Acetone	Above 20% concentration crystallizes
Cellulose Ester and Ethers	
1. Nitrocellulose	Miscible up to 20% Staybelite
2. Ethyl cellulose	Miscible in all proportions
3. Cellulose acetate	Not miscible above 25% Staybelite
Miscellaneous	
1. Vistanex (low viscosity)	Miscible in all proportions
2. Chlorinated rubber	Miscible up to 25%
3. Neoprene	Miscible in all proportions
4. Uformite	Miscible in all proportions

TABLE IV.—COMPATIBILITY OF WAXES WITH STAYBELITE

Wax Used	Solubility as Evidenced by Transparency	Insolubility as Evidenced by Wax as it Develops from a Haze, through Translucency to Opacity	Compatibility as Evidenced by Wax Characteristics Predominating	Incompatibility as Evidenced by Appearance of Checks and Cracks
		Staybelite		
Paraffine, %	2.5	2.5-20	20-40	40-95
Opalwax, %	7.5	7.5-50	.....	50-95
Carnauba wax, %	2.5	2.5-15	15-60	60-95
Candelilla wax, %	5	5 -70	70-95	.....
Montan wax crude), %	15	15 -40	40-70	70-95

TABLE V.—OXIDATION TEST OF STAYBELITE RESIN *VS.* WOOD ROSIN

(30 lb. oxygen pressure on approximately 10-g. samples through 40 mesh, in 50 mm. flat bottom glass dishes)

Wood Rosin		Staybelite Resin	
Hours	%	Hours	%
22	0.967	28	0.042
46	2.522	102	0.042
68	3.533	132	0.042
96	4.311	157	0.042
168	5.650	187	0.049
240	6.740		

Observation on solubility and compatibility characteristics of hydrogenated rosin with other resins, oil, waxes, and film-forming ingredients is presented in Tables III and IV.

Staybelite has an extremely pale initial color, grading X or better on the rosin scale and a maximum of 12 amber when measured on the Lovibond scale. For comparative purposes, the minimum Lovibond color for rosin grading WG is 19 amber; this value increases to a minimum of 65 amber for rosin of K grade. In contrast to rosin, Staybelite is highly resistant to discoloration when heated or exposed to sunlight in the presence of air under controlled conditions.

Color degradation of rosin is due to a number of causes, one of which is the formation of color bodies resulting from the oxidation of rosin. Therefore, it was of interest to determine the relative rate and extent of oxidation for hydrogenated rosin and rosin when subjected to a drastic and accelerated test. Samples of both were pulverized to obtain as large a surface area as possible and each placed in an autoclave under 30 pounds oxygen pressure at room temperature. At the end of 240 hours, the rosin gained 6.74% by weight. The test on hydrogenated rosin was discontinued after 187 hours because the resin had gained only 0.05% by weight and did not show any tendency to react further. Table V shows the accumulative increase in weight due to oxygen absorption as a function of exposure time expressed in hours.

The hydrogenated rosin soaps of the alkaline metals are water-soluble and undergo the same fundamental reactions as the rosin soaps; however, the former soaps are resistant to oxidation and to discoloration. This material can be precipitated from an aqueous solution of the soap by treatment with dilute solutions of either inorganic acids or organic acids. The water-soluble soaps undergo essentially the same reactions with water-soluble salts as do rosin soaps; for example, a water-insoluble calcium salt of hydrogenated rosin can be formed by the action of a water-soluble calcium salt on an aqueous solution of soap.

This material will react with metal oxides, such as calcium oxide, or zinc oxide, to form the corresponding metallic salt. This reaction is carried out at high temperature by merely heating the two ingredients.

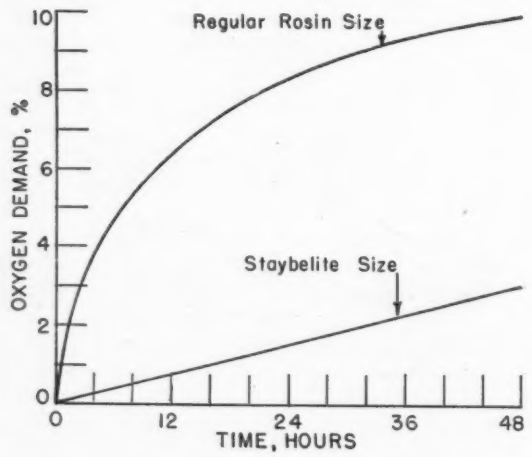

FIG. 1
Oxygen Demand of Staybelite Size vs. Rosin Size

Uses of Hydrogenated Rosin

In the production of paper for permanent records, resistance to discoloration and retention of sheet brightness are of fundamental importance. For this reason, among others, the size content of permanent record paper has been restricted to approximately 1.25% rosin size because of the known tendency of sized sheets to discolor during aging.

A principal consideration in undertaking the commercial production of hydrogenated rosin was to make available to the paper industry a new sizing material which would be not only as free from color as possible but highly resistant to discoloration. This objective has been accomplished and both paste size and dry size have been produced and are being used in the sizing of high quality paper.

In a subsequent article, Staybelite size will be discussed from the standpoint of its effect as a sizing material. The results of oxidation tests are shown in Fig. 1.

Sludging and Discoloration Corrected

This resin is used as a component of wax compositions for the production of waxed paper having high heat sealing strength. For many years, small quantities of rosin have been used for this purpose despite the fact that the rosin component will discolor and sludge out of the waxing bath. This discoloration and sludging action is attributed to color body formation and changes in solubility as a result of rosin oxidation. When Staybelite is used to replace rosin as a component of the waxing compositions, sludging and discoloration are corrected; and the heat sealing characteristics are, if anything, slightly better than those of the corresponding rosin-wax coating.

Rosin is widely used as an ingredient in rubber-base adhesives because of its tack producing characteristic. Unfortunately, if this type of pressure sensitive adhesive is exposed to the air, tackiness becomes reduced and the adhesive loses its pressure sensitive characteristic. Hydrogenated rosin does not oxidize, and its tack is not adversely affected by aging and, for these reasons, has solved a problem in the pressure-sensitive adhesive field as well as in various types of thermoplastic adhesive masses.

It can be used in most of the places where rosin is used, but the usefulness of rosin is limited because of its oxidizing and discoloring tendencies. Since this product does not undergo such changes, it is finding an increasing application in inks, lacquers, greases, synthetic resins, electrical applications, and soaps.

May Have Wide Application

Although Staybelite resin has been produced primarily to fill a need for a more permanent rosin size in the field of permanent and high-grade paper, it is conceivable that its properties may make it of interest as a size for less permanent paper or as a component of special emulsions and compositions for surface application to a wide variety of papers, particularly where high-brightness, extremely pale color, and resistance to deterioration on aging are of importance.

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You, too, are invited to make the test that has convinced so many other engineers. Just send us your name and address on the coupon below, stating the size and service for the packing. A working sample will be sent you, without charge or obligation.

GREENE TWEED & CO.
Bronx Blvd. at 238th St., New York, N. Y.

Send the Coupon

***CUTNO PACKING for alkalis**

* Reg. U.S. Pat. Off.

Made by the manufacturers of *PALMETTO

GREENE, TWEED & CO., Bronx Blvd. at 238 St., New York, N. Y.
Send free working sample of packing ..... size, for ..... service.
Name .....
Company .....
Address .....

Imports of Paper and Paper Making Stock

Giving Manifests of New York, Boston, Philadelphia and Other Ports of Newsprint, Wrapping, Writing, Coated, Blotting, Tissue, Strawboard; Bleached Sulphite More Acute—Some Grades of Old Waste Lower.

Effective September 30, 1939, under Treasury Decision 49,970, all publications, exchanges and trade associations, were denied access to import manifests at the New York Customs House. The Paper Trade Journal and other interested parties have vigorously protested this ruling, and as soon as the order of the Treasury Department is modified or rescinded, full publication of all manifests will be resumed in these columns. In the interim, the Paper Trade Journal is making every possible effort to gather all available information from manifests, at various outside sources.

NEW YORK IMPORTS

WEEK ENDING JULY 12, 1941

SUMMARY

Newsprint .....13,734 rolls
Filter paper .....34 cs.
Drawing paper .....10 cs.
Photo paper .....138 cs.
Cigarette paper .....117 cs.
Wallpaper .....1 cs.
Decalcomania paper .....46 cs. (Duplex), 2 cs. (Simplex)
Miscellaneous paper .....101 cs.

CIGARETTE PAPER

E. F. Pipe & Co., ——, Barcelona, 70 cs.
Kuenzle & Streiff, ——, Alicante, 17 cs.
Kuenzle & Streiff, ——, Barcelona, 30 cs.

NEWSPRINT

International Paper Co., ——, Gatineau, 286 rolls.
H. G. Craig Co., Inc., ——, Donnacona, 360 rolls.
——, ——, Comeau Bay, 9947 rolls.
H. G. Craig Co., Inc., ——, Donnacona, 366 rolls.
Perkins Goodwin &Co., ——, Botwood, 1804 rolls.
International Paper Co., ——, Gatineau, 292 rolls.
H. G. Craig Co., Inc., ——, Donnacona, 357 rolls.
International Paper Co., ——, Gatineau, 322 rolls.

WALLPAPER

W. H. S. Lloyd & Co., ——, Kobe, 1 cs.

FILTER PAPER

H. Reeve Angel & Co., Inc., ——, Liverpool, 21 cs.
H. Reeve Angel & Co., Inc., ——, Liverpool, 13 cs.

DRAWING PAPER

H. Reeve Angel & Co., Inc., ——, Liverpool, 10 cs.

PHOTO PAPER

——, ——, Liverpool, 138 cs.

DECALCOMANIA PAPER

B. F. Drakenfeld & Co., ——, Liverpool, 46 cs. (Duplex), 2 cs. (Simplex).

MISCELLANEOUS PAPER

Japan Paper Co., ——, Kobe, 11 cs.
National City Bank, ——, Kobe, 37 cs.
Japan Paper Co., ——, Kobe, 26 cs.
Walker Goulard Plehn Co., ——, Liverpool, 6 cs.
Japan Paper Co., ——, Kobe, 21 cs.

RAGS, BAGGINGS, ETC.

West Texas Cottonoil Co., ——, Buenos Aires, 334 bls. cotton linters.
F. P. Dow, ——, Shanghai, 100 bls. cotton waste.
American Cotton Products Co., ——, Shanghai, 95 bls. cotton waste.
Green Textile Associates, ——, Shanghai, 100 bls. cotton waste.
Brandwein Mazur & Co., ——, Shanghai, 75 bls. cotton waste.
Padawer & Co., ——, Shanghai, 240 bls. cotton waste.
Camden Fibre Mills, ——, Shanghai, 100 bls. cotton waste.
Padawer & Co., ——, Kobe, 100 bls. cotton waste.
E. J. Keller Co., Inc., ——, Kobe, 100 bls. old colored rags, 200 bls. bagging waste.
New England Waste Co., ——, Kobe, 50 bls. cotton waste.
J. Levy & Son, ——, Havana, 40 bls. rags.
——, ——, Liverpool, 7 bls. rags.

GLUESTOCK

Milligan & Higgins Corp., ——, Havana, 108 bls.

CASEIN

Tupman Thurlow Co., Inc., ——, Buenos Aires, 834 bags.

WOODPULP

——, ——, Sheet Harbor, 711 bls. ground woodpulp.
——, ——, Sheet Harbor, 1163 bls. ground woodpulp.
L. Hershman, ——, Botwood, 3048 bls. unbleached sulphite.

BOSTON IMPORTS

WEEK ENDING JULY 12, 1941

Elliott Addressing Machine Co., ——, Yokohama, 12 cs. paper.

Canada Cuts Chlorine Consumption

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., July 14, 1941—At the request of the Department of Munitions and Supply, Canada's pulp and paper industry has reduced its consumption of chlorine by 10%. This move does not affect newsprint paper or dissolving pulps used in the manufacture of rayon yarns, cellophane, plastics and allied products.

The order went into effect on June 23 and the amount of the reduction was determined by the average consumption during the six months ended May 31, last.

It will have the effect of a general lowering of color in pulps and all papers made from bleached woodpulp. In particular it will apply to all bleached pulps made for export and to pulps used in magazine, book, writing and other fine papers. As far as the public is concerned, the restricted use of chlorine will be of little or no concern, as the difference in the whiteness of paper will be practically unnoticeable.

The limitation of the use of chlorine in pulp and paper manufacture was desirable in view of the greater need of that particular product in the production of magnesium.

Pulp and paper manufacturers are taking readily to the new order, as they appreciate the use of chlorine as a bleaching agent in the manufacture of pulp must be sacrificed to more important purposes.

Correction

In the article entitled "Chemicals in the Pulp and Paper Industry," printed in the issue of May 29, 1941, it was inadvertently stated that the paper industry was the largest consumer of alum, accounting for 450,000 tons annually, 40% of the total United States consumption. The statement should have read, "The paper industry consumes 40% or 450,000 tons annually."

"NON-USERS ARE THE LOSERS"

50TH ANNIVERSARY

TENAX FELTS

The Halfway Mark!

Here we are halfway through our Fiftieth Anniversary Year. And halfway through a Century of Service to the Papermakers of America and their Superintendents . . . We wish to feature the occasion by renewing our pledge of Continuous Interest and Service. Let TENAX FELTS cooperate to solve papermaking problems, effectively and profitably.

"Non-Users Are The Losers"

1891 – LOCKPORT FELT COMPANY – 1941

NEWFANE, N. Y. — U. S. A.

"I didn't know you people made_____!"

(fill in to suit)

WE have been in business now for 50 years and yet quite often some good customer of ours says—"Why, I didn't know you people made friction clutches!" Or the exclamation might cover skip hoist drives, car pullers, door hoists or any one of many other Jones products.

In dealing with our suppliers we often find ourselves in the same position. We establish certain buying habits and it sometimes comes as a shock to find that a firm right around the corner may have just the services or the products we need.

We therefore present the group of catalogs shown below with the thought that some one of them may help you solve some problem that has just come up.

ANY, OR ALL OF THESE JONES CATALOGS SENT ON REQUEST

No. 70—Jones Herringbone Speed Reducers
No. 71—Jones Cut and Molded Tooth Gears
No. 75—Jones Worm Helical Speed Reducers
No. 55—Jones Spur Gear Speed Reducer Units
No. 68—Jones Worm Gear Speed Reducers
No. 60—Jones Lemley Friction Clutches.
No. 58B and **76**—Jones V-Belt Sheaves
No. 78—Jones Flexible Couplings
No. 56—Jones Roller Bearing Pillow Blocks
No. 69A—Jones Cast Iron Pulleys
No. 61—Jones Power Transmission Equipment

Jones

HERRINGBONE—WORM—SPUR—GEAR SPEED REDUCERS
CUT AND MOLDED TOOTH GEARS • V BELT SHEAVES
ANTI-FRICTION PILLOW BLOCKS • PULLEYS
FRICTION CLUTCHES • TRANSMISSION APPLIANCES

W. A. JONES FOUNDRY & MACHINE COMPANY
4443 Roosevelt Rd., Chicago, Ill.

New York Paper and Pulp Market Review

Backlog Orders For Paper Now Running Three To Five Weeks Above Capacity Production With Market Active and Prices Maintained—Roofing Rags More Active—Old Waste Paper Prices Firm.

Office of the PAPER TRADE JOURNAL,
Wednesday, July 16, 1941.

Increasing difficulty in obtaining deliveries of paper and paper board in quantities desired, is widely reported in the wholesale markets. Reports from many manufacturers' representatives, jobbers, and general paper merchants this week reflect increasing concern about adequate supplies for the future. The large and increasing requirements of the Government for paper, chemicals, transportation difficulties, priorities, price fixing and allocation of production, are the basic factors involved. More and more, as officials of the Administration have advised the public, defense needs are steadily rising to curtail the supply of goods for civilian use. Sacrifices on a substantial scale are expected to be made by industries and individuals.

The index of general business activity for the holiday week ended July 5 declined to 131.6%, from 132.8% for the preceding week, compared with 107.1% for the corresponding week last year.

Paper production for the week ended July 5 was estimated at 75.0%, compared with 69.0% for 1940, with 55.7% for 1939, with 58.9% for 1938, and with 69.8% for the corresponding week for 1937.

Paper board production for the week ended July 5 was 74.0%, compared with 72.0% for 1940, with 42.0% for 1939, with 37.0% for 1938, and with 44.0% for the corresponding week for 1937.

All trade reports indicate a high level of general business activity, high paper production and record backlog orders. For May, orders for paper were at 112.2% of capacity and for the last five months shipments of paper have exceeded production. This heavy demand has reduced mill stocks to the lowest level in several years. Current backlog orders are now reported to be running from 3 weeks to 5 weeks capacity operations. All prices are firm, with no change from prevailing quotations.

Chemical Pulp

Demand for all grades of chemical pulp is active, with spot prices substantially above contract quotations. Domestic production of bleached sulphite pulp for the first qaurter was some 2,500 tons less than for the like period last year, while the output of unbleached sulphite was some 7,400 tons more in that period.

Rags

Steady buying of paper making rags is reported this week. Prices are firm, with no important change from prevailing market quotations. Roofing rags are more active, with some mills reported to be in the market at higher than current quotations. As a whole, this market is strong, with prices well maintained.

Old Rope and Bagging

Mill buying of No. 1 domestic Manila rope continues active. Due to limited supplies and a strong demand this market continues in a strong position, with demand exerting pressure to advance prices. At this date no important change from prevailing quotations has been reported.

Trading in scrap bagging is little changed this week and prices are unchanged.

Old Waste Paper

Paper stock prices are firm under a good demand. Average representative prices are unchanged, with reports indicating little change in the price situation.

Twine

Demand continues to be reported at a high level in most grades of twine at this date. The imported fibers continue to reflect a strong position, with some reports being received that some manufacturers are accepting orders only on the basis of immediate shipments. Prices on soft fiber twines were advanced for the third quarter. Due to the fact that some leading manufacturers are accepting no new orders for Java and twines, due to demands of national defense and the difficult shipping situation, quotations on these items are viewed as nominal.

Paper Brightness To Be Reduced

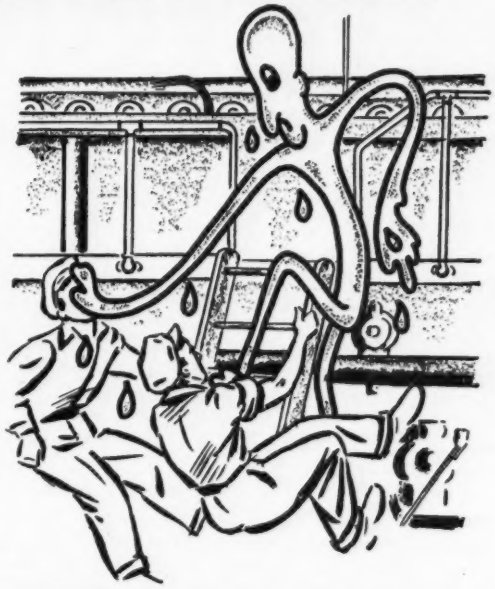
[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., July 14, 1941—Manufacturers of book and writing paper here have informed their customers that in future they may expect lowering of color in paper supplies, due to the fact that at the request of the government authorities Canada's pulp and paper companies are reducing their consumption of chlorine by 10%. The order is effective as of June 23, the amount of the reduction being based on average consumption during the six months ended May 31 last. It is explained that the difference in the whiteness of paper will hardly be noticeable by the general public. The restriction does not affect newsprint or dissolving pulps used in the manufacture of rayon yarns, cellophane, plastics and allied products. It will affect pulps and all papers made from bleached wood pulp, especially bleached pulps made for export and pulps used in book, magazine, writing and other fine papers. Pulp and paper manufacturers use chlorine for bleaching, and the restriction is called for owing to the greater need of chlorine in the production of magnesium.

Paul T. Graff Joins the Foxboro Co.

The Foxboro Company, makers of industrial instruments, announces that Paul T. Graff has joined its staff as a sales engineer, specializing in the promotion of the company's control instrumentation. He will be located at the company's main office, at Foxboro, Mass. To his new work Mr. Graff brings the benefit of broad experience in the oil refining industry and other fields in which instrumentation is extensively employed. He is a graduate of the Harvard Engineering School.

ARE YOU PAYING "TIME-AND-A-HALF" TO *Slimeform?**



When slime-forming micro-organisms get a foothold in your plant, it costs you *extra time* and *extra money* to stave off a crippling slow-down in production. You're faced with obstructed lines, plugged felts, and blinded wires. Breaks are more frequent, and "time-out" for wash-ups must be increased. What's more, there's a greater likelihood of spots, stains and pin holes in the finished product.

Why not solve the slime problem, once and for all, by a scientific approach to the source of the trouble . . . by making it impossible for micro-organisms to live and develop into tenacious films and accumulations throughout the system?

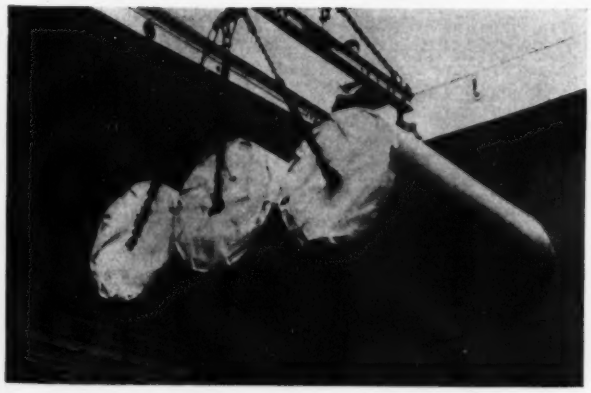
When you call in W&T, you get the experience developed in more than 300 paper-mill installations for slime elimination and microbiological control. And the cost of using chlorine or chloramine to keep the plant permanently free from slime averages no more than 1½ to 6 cents per ton of product. Better write W&T today. P-26

* Slime-forming organisms that thrive in process water.

WRITE FOR 42-PAGE BOOKLET
"Micro-biological Control in Pulp and Paper Manufacture" discusses latest practice now employed at prominent mills. Write for a copy.

WALLACE & TIERNAN CO., Inc.
MANUFACTURERS OF CHLORINE AND AMMONIA CONTROL APPARATUS
NEWARK, NEW JERSEY . . . REPRESENTED IN PRINCIPAL CITIES

TOUGH PAPER MILL CORES



For all uses that require an extremely tough, strong, durable product, SONOCO has developed the new RHINO non-returnable paper mill core. Exhaustive tests for breaking and crushing strength and all around toughness indicate its superior qualities.

Exclusive distributors
BERMICO (Reg. Trade Mark) **ENDS** *and* **BERMICO** (Reg. Trade Mark) **FIBRE CORES**
Strong cellulose fibres are formed into a homogeneous tube and then especially treated to resist all weather and moisture changes. The Bermico Core is light in weight and extremely hard, strong, rugged. These particular cores have exceptionally long life in either returnable or mill roll service.

SONOCO MAKES *EVERYTHING* IN *PAPER CARRIERS*

Returnable Cores
Equipped With
BERMICO* Metal Ends

DURO is a standard core of plus-standard quality. Made from our own especially manufactured paper stock. DURO cores are made standard 3⅛" I. D. These cores are equipped with BERMICO open or closed notch, metal ends to fit 3" shaft. TAYLOR Ends that protect inside of core only, can also be specified.

EN-DURO a super-quality core to meet extra demands for strength and service where needed. This is our highest grade core. All cores will take either BERMICO or TAYLOR Ends which can be furnished lacquered in various colors for easy identification. . . Both DURO and EN-DURO cores have a thick kraft surface cover.

* (Reg. Trade Mark)

SONOCO PRODUCTS COMPANY
HARTSVILLE, S. C. · MYSTIC, CONN. · BRANTFORD, ONT.
SHIPPING POINTS: LOWELL, MASS. HARTSVILLE, S. C.
DEPENDABLE SOURCE OF SUPPLY

MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL,
Wednesday, July 16, 1941.

BLANC FIXE—Prices on blanc fixe are firm and unchanged and conform to prevailing market levels. The pulp is currently quoted at $35 per ton, in barrels, at works; the powder is currently quoted at $50 per ton, f.o.b., works. Demand reported moderate for the week.

BLEACHING POWDER—Quotations on bleaching powder are firm. Demand reported active for the week. Bleaching powder is currently quoted at $2 per 100 pounds, in drums, at works.

CASEIN—Prices on casein are firm, with prices higher for the current week. Standard domestic casein, 20-30 mesh, is currently quoted at 22 cents per pound; 80-100 mesh, at 22½ cents per pound. All prices in bags, car lots. Argentina casein, 20-30 mesh, is currently offered at 21 cents per pound. No quotations on French casein.

CAUSTIC SODA—Quotations on caustic soda are firm and continue unchanged at prevailing market prices. Demand reported active. Solid caustic soda is currently quoted at $2.30 per 100 pounds; flake and ground at $2.70 per 100 pounds, in drums, at works.

CHINA CLAY—Prices on china clay are firm and conform to prevailing market levels. Demand reported moderate at this date. Domestic filler clay is currently quoted at from $7.50 to $15 per ton; coating clay at from $12 to $22 per ton, at mines. Imported clay is currently offered at from $13 to $25 per ton, ship side.

CHLORINE—Quotations on chlorine are firm and unchanged. Market on priority basis. Shipments reported inadequate to demand this week. Chlorine is currently quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The rosin market is reported firm for the week with prices higher on some grades. "G" gum rosin is currently quoted at $2.35 per 100 pounds, in barrels. Savannah "FF" wood rosin is currently quoted at $2.35 per 100 pounds, in barrels, New York. Seventy per cent gum rosin size is quoted at $2.89 per 100 pounds, f.o.b., works.

SALT CAKE—Prices on salt cake are firm and nominal. Demand active. Domestic salt cake is currently quoted at $16 per ton, in bulk; chrome cake at $16 per ton. All prices in car lots, f.o.b., shipping point. The quotation of $16 per ton imported salt cake is nominal.

SODA ASH—Quotations on soda ash are firm and continue to conform to prevailing market levels. Demand reported active for the week. Prices on soda ash in car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Prices on corn starch are more firm and are reported unchanged for the current week. Pearl is currently quoted at $3.10 per 100 pounds; powdered starch at $3.20 per 100 pounds. All prices in bags, car lots, f.o.b., Chicago.

SULPHATE OF ALUMINA—Quotations on sulphate of alumina are firm. Demand reported active for the current week. The commercial grades are currently quoted at $1.15; iron free at $1.60 per 100 pounds. All prices in bags, car lots, f.o.b., works.

SULPHUR—Prices on sulphur are firm and conform to prevailing market levels. Annual contracts are currently quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are quoted at $19 per ton.

TALC—Quotations on talc are firm and continue unchanged at prevailing market prices. Domestic talc is currently quoted at from $15 to $21 per ton, at mines. No quotations on imported talc.

MARKET QUOTATIONS

Paper

(Delivered New York)

News, per ton—			
Roll, contract	$50.00	@	—
Sheets	58.00	"	—
Kraft—per cwt.—Delivered Zone A			
Northern, Extra Quality	$5.25	@	$6.00
Superstandard	4.87½	"	5.25
Northern Standard Wrapping	4.50	"	5.00
Standard Wrapping	4.50	"	—
Tissues—Per Ream—Carlots			
White No. 1	.97½	"	—
White No. 1 M. G.	.95	"	—
White No. 1½	.80	"	—
White No. 2	.75	"	—
Anti-Tarnish M. G.	.80	"	—
Colored	.85	"	—
Kraft	.87½	"	—
Manila	.77½	"	—
Unbl. Toilet, 1 M.	3.75	"	—
Bleached Toilet	5.26	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	2.10	"	—
Bleached, Jr.	3.60	"	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	8.75	@	10.75
No. 1 Manila Wrapping, 35 lb.	5.50	"	5.75
No. 2 Manila Wrapping, 35 lb.	5.25	"	5.50
Boards, per ton—			
News	42.50	@	—
Chip	42.50	"	—
Sgl. Mla. Ll. Chip	57.50	"	—
White Pat. Coated	72.50	"	—
Kraft Liners	55.00	"	—
Binders Boards	80.00	"	—

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items. Delivered in Zone 1:

	Bonds		Ledgers	
100% Rag Ext. No. 1	$39.10 @	$46.00	$40.25 @	$47.25
100% Rag	31.05 "	36.50	32.20 "	37.75
85% Rag	.... "	....	29.90 "	35.00
75% Rag	23.60 "	27.75	24.75 "	29.00
65% Rag	.... "	....	21.65 "	26.25
50% Rag	17.55 "	21.50	18.70 "	22.75
25% Rag	14.65 "	17.75	15.80 "	19.25

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items. Delivered in Zone 1:

	Bonds		Ledgers	
No. 1	$9.35 @	$11.50	$11.55 @	$12.75
No. 2	8.50 "	10.25	9.65 "	11.75
No. 3	8.05 "	9.25	9.20 "	11.25
No. 4	7.70 "	9.50	8.90 "	10.75

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper.

Delivered in Zone 1:

No. 1 Glossy Coated	$11.90	@	$13.50
No. 2 Glossy Coated	10.35	"	11.75
No. 3 Glossy Coated	9.55	"	11.00
No. 4 Glossy Coated	9.15	"	10.50
No. 1 Antique (watermarked)	9.05	"	10.50
No. 2 Offset	8.40	"	9.75
A Grade E. F.	8.20	"	9.50
A Grade S. & S. C.	8.45	"	9.75
B Grade E. F.	7.65	"	8.75
B Grade S. & S. C.	7.90	"	9.00
C Grade E. F.	7.35	"	8.50
C Grade S. & S. C.	7.60	"	8.75
D Grade E. F.	7.10	"	8.25
D Grade S. & S. C.	7.35	"	8.50

Ivory & India at $.50 cwt. extra.

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	No prices		
Dry	No prices		

(Delivered)

No. 1 Domestic and Canadian	40.00	@	42.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	3.72½	@	3.87½
Prime Qualities—			
Easy-Bleaching Sulphite	3.17½	"	3.75
Strong Unbleached Sulphite	3.17½	"	3.75
News Grade, delivered			
Unbleached Sulphite	61.00	"	64.25

(On Dock, Atlantic Ports)

Kraft Bleached	4.12½	"	—
Kraft Light & Strong	3.75	"	4.15
Kraft No. 1	3.60	"	4.00

(F. o. b. Pulp Mill)

Kraft Domestic and Canadian	2.75	"	3.37½

(Delivered)

Soda Bleached	3.30	"	—

Add 60 cents per short ton, dock charges for Albany; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	6.00	@	6.25
Silesias No. 1	4.25	"	4.50
New Unbleached	6.00	"	6.25
Blue Overall	4.25	"	4.75
Fancy	2.25	"	2.50
Washables	2.00	"	2.15
Mixed Khaki Cuttings	2.50	"	2.75
O. D. Khaki Cuttings	3.00	"	3.15

Old Rags

White, No. 1—			
Repacked	3.10	"	3.35
Miscellaneous	2.35	"	2.65
White, No. 2—			
Repacked	2.50	"	2.75
Miscellaneous	2.00	"	2.25
Thirds and Blues—			
Repacked	1.25	"	1.35
Miscellaneous	1.10	"	1.25
Roofing Rags—			
No. 1	1.30	"	1.35
No. 2	1.20	"	1.25
No. 3 (bagging)	.95	"	1.00
No. 4	.90	"	.95
No. 5A	.90	"	.95

Foreign Rags

All prices nominal

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.50	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxfords	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.50
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—

West Virginia Pulp and Paper Company

230 Park Ave.
New York

35 East Wacker Drive
Chicago

Public Ledger Building
Philadelphia, Pa.

503 Market St.
San Francisco, Cal.

Manufacturers of

ENGLISH FINISH SUPERCALENDERED MACHINE FINISHED BOOK and LITHOGRAPHIC PAPERS

Offset, Envelope, Bond, Writing, Mimeograph, Ledger, Eggshell, Cover and Music Papers, Index Bristol, Post Card and Label Papers

HIGH GRADE COATED BOOK

• • • •

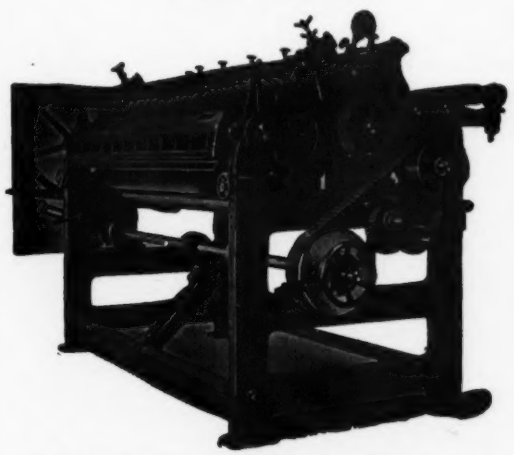
KRAFT WRAPPING AND KRAFT ENVELOPE
KRAFT LINER BOARD
BLEACHED SULPHITE AND SODA PULP
BLEACHED AND UNBLEACHED KRAFT PULP

MILLS:

Mechanicville, New York
Luke, Maryland
Covington, Virginia
Tyrone, Pennsylvania
Williamsburg, Pennsylvania
Cass, West Virginia
Charleston, South Carolina

MODEL 28

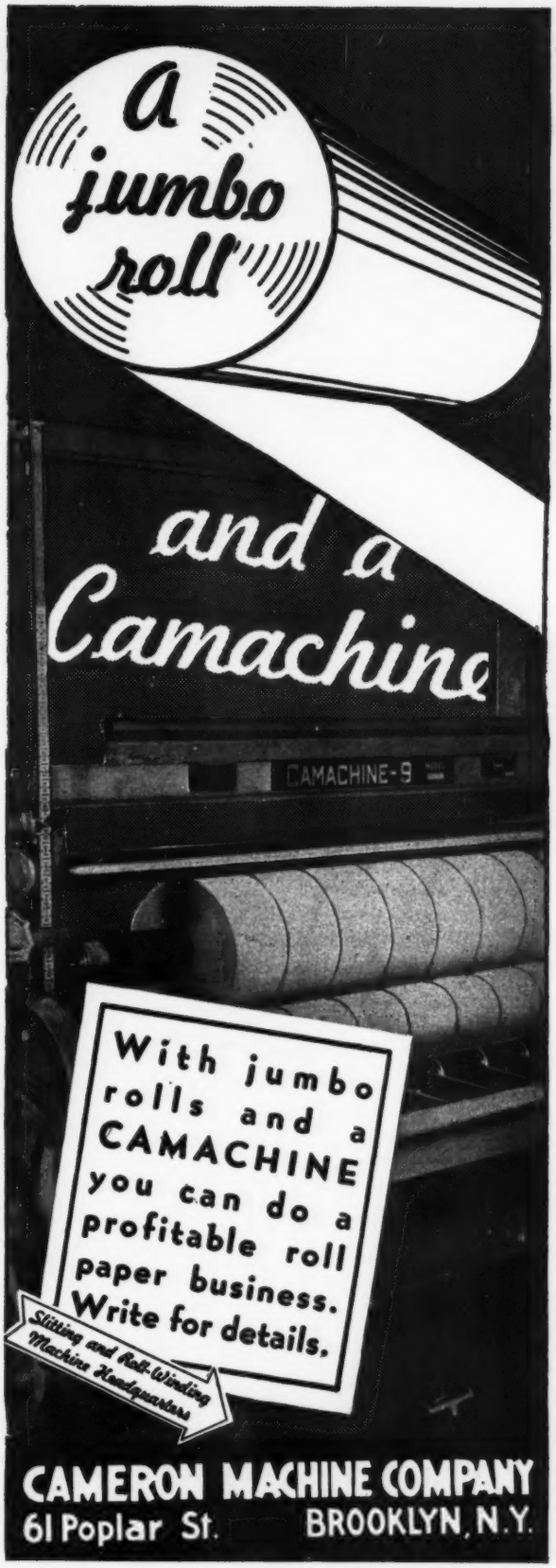
ROLLER BEARING CUTTER



HAMBLET MACHINE CO.

LAWRENCE, MASS.

MAKERS OF
SINGLE, DUPLEX AND DIAGONAL PAPER CUTTERS
CUTTER KNIVES, PATENT TOP SLITTERS.


a jumbo roll
and a Camachine
CAMACHINE-9
With jumbo rolls and a CAMACHINE you can do a profitable roll paper business. Write for details.
Slitting and Roll-Winding Machine Headquarters
CAMERON MACHINE COMPANY
61 Poplar St.
BROOKLYN, N.Y.

No. 4 White Linens.	2.25	@	3.25
No. 1 White Cotton.	4.25	"	4.75
No. 2 White Cotton.	3.25	"	3.75
No. 3 White Cotton.	2.50	"	3.00
No. 4 White Cotton.	1.90	"	2.20
Extra Light Prints..	2.00	"	2.40
Ord. Light Prints...	1.75	"	2.15
Med. Light Prints...	1.55	"	1.95
Dutch Blue Cottons.	2.25	"	2.50
French Blue Linens.	3.00	"	—
Checks and Blues...	2.00	"	—
Linsey Garments....	1.90	"	2.00
Dark Cottons.....	1.50	"	1.60
Old Shopperies.....	1.30	"	1.45
New Shopperies.....	1.45	"	1.50
French Blues.....	2.25	"	2.50

Old Rope and Bagging

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	Nominal		
Domestic	4.15	@	4.25
Wool Tares, light....	2.50	"	2.75
Wool Tares, heavy..	2.50	"	2.75
Bright Bagging.....	3.15	"	3.30
Manila Rope—			
Foreign	5.75	"	6.00
Domestic	5.75	"	6.00
Jute Threads.....	2.75	"	3.00
Sisal Strings	2.10	"	2.35
Mixed Strings.....	1.10	"	1.20

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	3.10	@	3.25
Ordinary Hard White No. 1....	2.75	"	3.00
Soft White No. 1..	2.35	"	2.50
Soft White Extra..	2.70	"	2.85
Flat Stock—			
Stitchless	1.10	"	1.25
Overissue Mag.....	.90	"	1.00
Solid Flat Book...	.90	"	.95
Crumbled No. 1 ..	.70	"	.75
Ledger White Stock.	1.65	"	1.75
Ledger Stock Colored	1.20	"	1.30
Manila—			
New Env. Cut....	1.70	"	1.80
New Cuttings.....	1.80	"	1.90
Old Kraft Machine Compressed bales..	1.35	"	1.50
News—			
No. 1 White News	1.50	"	1.60
Strictly Overissue.	.75	"	.80
Strictly Folded....	.65	"	—
Corrugated	.80	"	—
No. 1 Mixed Paper..	.57½	"	—

Twines

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.20	@	—
White Hemp.....	.20	"	—
Fine Polished—			
Fine India.....	.24	"	—
Unpolished—			
Box	.16½	"	—
Paper Makers.....	.16	"	—
Tube Rope.....	.17½	"	—
Wall Paper.....	.19½	"	—
Wrapping	.21	"	—
Soft Fiber Rope...	.18	"	—
Cotton	.24	"	—
(Hard Fiber)			
Medium Java.....	.15	"	—
Mex. Sisal.....	.14	"	—
Manila	.26	"	—

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f. o. b. Phila.)

Shirt Cuttings—			
New White No. 1.	.06½	@	.06¾
New White No. 2.	.03½	"	.04
Light Silesias.....	—	"	.04½
Silesias, No. 1....	—	"	.04
Black Silesias, soft	—	"	.03
New Unbleached..	.06¼	"	.06½
Washable Prints..	.02½	"	.03
Washable No. 1..	—	"	.01½
Blue Overall.....	.04	"	.04½
Cottons—According to grades—			
Washable shredding	—	"	.01½
Fancy Percales....	.03	"	.03¼
New Black Soft...	.02½	"	.02¾
New Light Seconds	—	"	.04
New Dark Seconds	—	"	1.50
Khaki Cuttings—			
No. 1 O. D.....	.03	"	.03¼
No. 2 Mixed.....	.02	"	.02¼
Corduroy	.01¼	"	.01½
New Canvas.....	.04½	"	.05
New Black Mixed.	—	"	.02¼

Domestic Rags (Old)

White No. 1—			
Repacked	3.00	@	3.50
Miscellaneous	2.75	"	3.00
Thirds and Blues—			
Miscellaneous	1.35	"	1.50
Repacked	1.55	"	1.65
Black Stockings (Export)	Nominal		
Roofing Stock—			
Foreign No. 1....	Nominal		
Domestic No. 1...	1.30	"	1.35
Domestic No. 2...	1.10	"	1.15
Roofing Bagging..	1.00	"	1.05

Bagging

(F. o. b. Phila.)

Gunny, No. 1—			
Foreign	3.25	@	3.75
Domestic	3.50	"	3.75
Manila Rope.....	—	"	5.50
Sisal Rope.....	2.00	"	2.25
Mixed Rope.....	.75	"	1.00
Scrap—			
No. 1.....	3.25	"	3.50
No. 2.....	—	"	1.50
Wool Tares, heavy...	4.00	"	4.25
No. 1 New Light Burlap	3.00	"	4.00
New Burlap Cuttings	3.25	"	3.50

Old Papers

(F. o. b. Phila.)

Shavings—			
Hard White Special	2.75	@	2.85
Hard White.....	2.50	"	2.60
No. 1 Soft White..	2.00	"	2.25
No. 2 White.....	1.85	"	1.90
No. 1 Mixed.....	1.00	"	1.20
Solid Ledger Stock..	1.90	"	2.00
Ledger Stock, white.	1.60	"	1.75
Ledger Stock, colored	1.30	"	1.40
No. 1 Books, heavy..	1.15	"	1.20
Manila Cuttings.....	1.90	"	2.00
Print Manila.....	.60	"	.65
Container Manila....	.50	"	.55
Kraft Paper.....	1.45	"	1.50
No. 1 Mixed Paper..	.57½	"	—
Straw Board Chip...	.50	"	—
Binders Board Chip..	.50	"	—
Corrugated Board....	.80	"	—
Overissue News.....	.85	"	.90
Old Newspapers.....	.65	"	—

BOSTON

Old Papers

(F. o. b. Boston)

Shavings—			
No. 1 Hard White	3.15	@	3.25
No. 1 Soft White	2.50	"	2.75
No. 2 Mixed.....	.90	"	1.00
Solid Ledger Books..	2.00	"	2.10
Overissue Ledger Stock	1.75	"	2.00
White Ledger Stocks	1.50	"	1.65
Mixed Ledgers	1.25	"	—
No. 1 Heavy Books	1.10	"	1.20
No. 1 Books, Light..	.75	"	.85
Crumpled Stitchless Book Stock.....	1.15	"	1.20
Manila Env. Cuttings	3.00	"	3.25
Manila Envelope Cuttings, extra quality	2.75	"	3.00
White Blank News..	1.70	"	1.80
No. 1 Kraft.....	1.35	"	1.45
Extra No. 1 Kraft..	1.75	"	—
Mixed Papers.....	.57½	"	—
Print Manila.....	.70	"	—
Container Manila....	.65	"	.75
Old Newspapers.....	.65	"	—
Paper Wool Strings.	1.30	"	1.35
Overissue News.....	.65	"	.70
Box Board Chips....	.35	"	—
Corrugated boxes....	.80	"	.85
Kraft corrugated boxes	1.25	"	1.35
New Kraft Corrugated Cuttings	1.90	"	2.00
Screening Wrappers.	.85	"	.90

Bagging

(F. o. b. Boston)

Gunny Bagging—			
Foreign	(nominal)		
Domestic	4.25	@	4.75
Sisal Rope.....	3.00	"	3.25
Mixed Rope.....	1.00	"	1.25
Transmission Rope—			
Foreign	(nominal)		
Domestic	2.75	"	3.00
Soft Jute Rope.....	4.75	"	5.00
Manila Rope—			
Foreign .....(nominal)			
Domestic	6.00	"	6.25
Jute Carpet Threads.	3.00	"	3.25
Bleachery Burlap....	6.00	"	6.25
Scrap Burlap—			
Foreign	(nominal)		
Domestic	3.25	"	3.75
Scrap Sisal.....	3.00	"	3.25
Scrap Sisal for Shredding	3.25	"	3.50
Wool Tares—			
Foreign	(nominal)		
Domestic	4.00	"	4.25
Aust. Wool Pouches.	4.25	"	4.60
New Burlap Cuttings	4.50	"	5.00
Heavy baling bagging	3.50	"	4.00
Paper Mill Bagging..	3.50	"	3.75
No. 2 Bagging.....	.60	"	.75

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints.	—	@	.03
Fancy Percales....	.03¾	"	4.00
New White No. 1.	.06	"	.06¼
New Light Flannelettes	.03¾	"	4.00
Canton Flannel, Bleached	.06½	"	.06¾
Underwear Cutters, Bleached	.06¼	"	.06¾
Silesias No. 1.....	.04	"	.04¾
New Black Silesias..	4.00	"	—
Red Cotton Cuttings	.04	"	.05
Soft Unbleached....	.06	"	.06¼
Blue Cheviots.....	.04¼	"	.04½
Fancy	.01½	"	.01¾
Washable	.01½	"	.01¾
Cottons—According to Grades—			
Blue Overalls.....	.04	"	.04¼
New Black, Soft..	.03	@	.03¼
Khaki Cuttings.....	.02	"	.02¼
O. D. Khaki.....	.02½	"	.03¼
Corduroy	.02	"	—
New Canvas.....	.05½	"	—
B. V. D. Cuttings...	.06	"	.06¼

Domestic Rags (Old)

(F. o. b. Boston)

White No. 1—			
Repacked	2.75	@	3.00
Miscellaneous	2.00	"	2.25
White No. 2—			
Repacked	1.90	"	2.00
Miscellaneous	2.00	"	2.25
Twos and Blues.....	2.00	"	2.25
Old Blue Overalls...	1.60	"	2.00
Thirds and Blues....	1.25	"	—
Miscellaneous	1.25	"	1.35
Black Stockings.....	3.50	"	4.00
Roofing Stock—			
No. 1.....	1.20	"	1.25
No. 2.....	.95	"	1.00
No. 3.....	.85	"	.95

Foreign Rags

(F. o. b. Boston)

Canvas .....(nominal)	
Dark Cottons.....(nominal)	
Dutch Blues.....(nominal)	
New Checks and Blues(nominal)	
Old Fustians.....(nominal)	
Old Linsey Garments.(nominal)	
New Silesias.....(nominal)	

CHICAGO

Waste Paper

(F. o. b. Chicago)

Shavings—			
No. 1 White Envelope Cuttings....	3.00	@	—
No. 1 Hard White	2.50	"	2.65
No. 1 Soft White.	2.00	"	2.20
Ledger and Writings	1.30	"	1.45
Solid Books	1.10	"	1.15
Blanks	1.50	"	1.55
Krafts	2.20	@	2.30
New Kraft Cuts....	2.40	"	2.50
Overissue News.....	.75	"	.85
Old Newspapers—			
No. 1 Folded News	.70	"	.75
No. 1 Mixed Paper	.60	"	.65
Roofing Stocks—			
No. 1.....	.95	"	1.00
No. 2.....	.85	"	.90

CONSIDER WATER POWER

(Continued from page 9)

Elmer H. Jennings, and Charles L. Dostal of Philadelphia. Mr. Sage's father is vice-president of Kimberly-Clark Corporation, and Miss Jennings' father is vice-president of Thilmany Pulp and Paper Company, Kaukauna, Wis. Mr. and Mrs. Sage will reside at Lake Winnebago for the summer. The bridegroom is associated with Kimberly-Clark Corporation at Neenah.

Hermsen-Sensenbrenner

Miss Agnes Louise Sensenbrenner, daughter of Mr. and Mrs. Rudolph M. Sensenbrenner, Menasha, Wis., and Gerald G. Hermsen of Little Chute, Wis., were married June 7 at St. Patrick Catholic church at Menasha. The bride's father is vice-president and general manager of the George A. Whiting Paper Company ,and the bridegroom is associated with the Menasha Products division of the Marathon Paper Mills Company at Menasha.

Buchanan-Ebben

M. A. Buchanan, a member of the Institute of Paper Chemistry staff at Appleton, Wis., and Miss Catherine Ebben of Appleton, were married July 8 at Kirksville, Mo. Mr. Buchanan is an instructor in organic chemistry.

Lyons-Snyder Engagement Announced

The engagement was announced last week of Owen E. Lyons, Appleton, Wis., and Miss Josephine Snyder, Milwaukee, Wis., daughter of Dr. and Mrs. H. E. Snyder, Columbus, Nebr. Mr. Lyons is a graduate of the University of Wisconsin and is advertising manager of the Menasha Products division of the Marathon Paper Mills Company, Menasha, Wis.